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The Duty Now to Be Performed

President Wilson is in one of the characteristic moods that so frequently distinguish his public announcements when he says that there is no cause for alarm in this country and that there is an opportunity for this nation to reap great permanent glory provided nobody loses his head. This is at once a reassurance and a caution. Reason is more likely to rule in the higher matters of state if it rules in those of lesser importance throughout the nation. There is a time for all things, and these are the moments when it is profitable to remember that confidence begets confidence. It is idle to attempt to forecast the ultimate results of the appalling events in Europe, but it is well worth while for each industry and all of its people to work earnestly to keep this country orderly in the chaos of world markets. Sooner or later the war clouds will lift, and if sober judgment directs business affairs here the nation will be ready, as Mr. Wilson tells us to remember, to help the rest of the world. What the authorities want done to further this end will be done with courage by all business interests. It is a task in which each one has a part. That part does not lie in the denial of grave and troublous conditions abroad, but in the determination to assert and make the most of the bountiful sources of satisfaction that business men find here if they stir themselves enough to look about. With the first shock of greatly altered conditions already withstood creditably, it is natural for the electrical and all other industries of tested and proved strength to return to vigorous work.

Urgent Need for Merchant Marine

Nothing that has occurred in the history of the nation has so aroused it to a realization of our woefully inadequate merchant marine as the present unhappy situation. With crops and products in abundance and gaping markets we are letting the days slip by without selling freely to needy buyers. It is true, as Mr. Maurice Coster points out in the interview published elsewhere in this issue, that the effective development of export trade by manufacturers requires the cooperation of the government and the banks. Banks have taken steps to furnish facilities for handling funds in the temporary cessation of European banking operations. The question now is whether our government will do its part. The government cannot create merchant vessels out of a clear sky but it can do something by speedy enactment of the pending relief measure. After following for many years a halting policy in the development of a merchant marine the nation cannot in a day undo the mischief which inevitably results from that policy. What it can do is to conclude that it has been unwise to the point of improvidence in ignoring the lack of steamships to move goods to foreign lands and that it will adopt forehanded measures for the future. If it was necessary to judge the chances of legislation favoring this end only by the recent activities of the present body of lawmakers in Washington, there would be some doubts about relief. The members now sitting in Congress have labored to put fetters on business rather than to remove hindrances to commercial advance. However, responsibility and a real crisis bring out the best in man. Congress can rectify for the future the mistake of the past. The object lesson is plain. This country has relied too much on foreign aid in its export trade. As matters stand now, it is not free to go ahead and build up that trade without the consent of others who are virtually natural competitors. It will not answer to say loftily that since the crops and goods are here nations that want them will find a way to come and get them. That delinquent attitude belongs to the old days. American manufacturers require a policy in Congress that will supply vessels to promote and protect their commerce.

The Springfield Rate Case

The Missouri Public Service Commission has denied the application of the Springfield Gas & Electric Company for a rehearing of the electrical rate case. Unless the company is to conform to the terms of this drastic order, the only thing that it can do now is to take the case into the courts. We had occasion in an earlier case to commend the Missouri commission for its courage in rescinding an order which it was wrong in issuing. Because of the revelation in that case that the commissioners were not above admitting that they were human and had made a mistake there was some reason to think that in the Springfield case the answer of the company might lead to a reconsideration of the merits of the finding. No such attitude controlled the commission, however. The one member who, upon reconsideration, expressed grave doubts whether the company had been allowed sufficient valuation and an adequate return was outvoted by his colleagues. The petition of the company for a rehearing, which was reported in last week's issue, presents the argument with a noticeable absence of the byplays to the galleries which encumbered the original decision of the commission. The answer of the company was dignified; the decision of the commission was plainly deficient in that dignity which should characterize the rulings of a body having

such vast powers. The extreme language of the commission is revealed in sharp contrast with the calm answer of the company. It has come to be the practice of some of the commissions, whenever the way is open, to "roast the corporations." This is an easy way of acquiring notoriety. It should be just as fair for the companies to criticise commissions guilty of dereliction or actions taken with an eye to the unthinking public applause as for commissions to attack companies. Practically, however, the commissions have the upper hand. It is inexpedient for the companies to criticise them. The fact that the companies are somewhat dependent on the good will of the commissions does not make chastisement by the commissions any fairer; it ought to make the commissions temperate in their language. We do not urge that wrongs be ignored, but do urge that the commissions and the companies co-operate to develop the best properties and service to the end that all interests concerned may be conserved and protected. Few of the commissions are deeply sunk in politics, but those that permit their conclusions to be spoiled by political considerations do much to discredit the policy of regulation.

The Alton Auxiliary Plant

The steam auxiliary of the Keokuk plant, a description of which is published in this issue, represents an excellent example of this class of generating station. The design of auxiliary stations calls for good judgment. The character of the installation as well as its size depends upon the hydraulic conditions in a way that may become exceedingly puzzling. In some instances, when the auxiliary station is likely seldom to be called into action, minimum cost is the controlling feature of design. In other cases, when the load on the auxiliary station is carried for long periods, it is necessary to design for very high efficiency even at large expense.

In the present case the conditions are such that it seemed wise to put all the steam reserve into a single large unit, worked in parallel when necessary with the substation fed with energy from the Keokuk station. Hence the installation of a single large turbo-generator with its boiler equipment standing alone at its work, although there is ample provision for the enlargement of the equipment when needed. The steam plant proper is perhaps the most interesting feature, although the electrical portion of the plant is somewhat out of the ordinary also. For economical service it is necessary to operate the auxiliary plant at widely varying loads, and a combination of natural and forced draft has been introduced to meet the load requirements. For light loads the stack furnishes ample draft, but when the plant is to be operated at the limit of its output a steam-driven blower delivering up to 100,000 cu. ft. of air per minute is put into service.

In the condenser equipment an interesting problem had to be solved. Water for the condenser is obtained from the Mississippi, there being a considerable variation in the temperature and in the lift required. The condenser pump is therefore electrically driven from a special variable-speed direct-current motor, receiving energy from one of the rotary converters with which the station is provided, so that the speed can be nicely adjusted to maintain high efficiency under any conditions of water supply. One very admirable feature resides in the complete provision made for the continuous weighing of both the water and the coal consumed so that the plant can be kept practically under test conditions all the time if it is found desirable. A complete set of instruments records all the operating temperatures so that it is easy to follow every detail that affects the efficiency. Altogether the plant is very unusual, especially considering the fact that it is fundamentally an auxiliary, and it contains many details worthy of careful examination by the designing engineer who wishes to keep in touch with the latest practice.

The Making of Rate Schedules

In a recent article in the *Elektrotechnische Zeitschrift* Dr. G. Siegel summarizes very instructively the chief features of the systems of charging for lighting and motor service in use throughout the countries most active in electrical distribution. Without plunging into dismal statistics, already made useless by the exigencies of the world struggle now in progress, certain facts must be recognized as forming the basis of prices in every country. To begin with, the general scale of prices for electric service is determined by local conditions which vary from country to country and from place to place in each country. The most important of these is the cost of fuel.

In spite of the ingenuity that has been exercised in working out so-called scientific rates, the bald fact that practically the world over different prices are charged for energy for lighting and for motor service drawn from the very same mains gives irrefutable proof that the rate is actually determined on principles wholly commercial as are the prices of any other commodity. In case of some of the modified demand systems now in use the same schedule may apparently be made operative for lighting and for motor service, but there is no real exception to the rule, for a little examination almost invariably shows that the scale is so formulated as to separate the two classes of service practically, if not theoretically.

Looking over Dr. Siegel's data, it at once appears that, on the whole, throughout the world the tendency is toward a rate based on a standby charge plus a meter charge in the larger stations, while a flat rate or discounted meter rate is the rule in the smaller stations. Perhaps the lesson to be drawn is that on heavily loaded systems the standby costs are far more keenly felt than in small plants where fully loaded apparatus and lines are the exception. Flat rates either by contract or by meter are decidedly the exception in all countries. But the demand idea has undergone an interesting evolution which shows at least an elementary recognition of its one-sided character. In theory the measured demand is what really determines the

standby costs, in so far as these are unrelated to the time of their occurrence. In practice it seems to have been the general rule that for the purpose of fixing rates the demand is taken in some arbitrary and conventional manner. Just what form is given to it depends upon circumstances, and the usual result is probably nearer to a just average charge than the measured demand would be.

In any such scheme of charging the fixed price can be and often is so set as to produce the same general result as some particular form of quantity discount, and this ultimately is the equivalent of selecting a schedule of prices based on what the traffic will stand considering the local demands and conditions. Such is commonly the final result of the commercial evolution of a rate schedule quite independent of its beginnings. In the many municipal plants in England and on the Continent various elements tend to modify the prices charged in a most irregular fashion. Speaking broadly, the municipal prices in England are relatively low as compared with those on the Continent, where complaints of the prices are often heard. Perhaps this result is attributable to the tendency, especially strong in Germany, for cities to engage in many kinds of business on a profit-making basis.

The point of greatest variation in rate schedules seems to be the relation between the lighting and the motor-service charges. This is true of our own country and most others as well. In two cities apparently working on about the same basis in lighting enormous variations are found in the motor-service rates, especially in the heavier classes of service. Dr. Siegel's data make it evident that such variations are general phenomena, and that there is great need to arrive at standard methods of reckoning so that in two neighboring or even contiguous communities there may not be wide differences in charges for similar services.

Optimum Wave-Length in Radiotelegraphy

The best wave-length for use in regular communication between any pair of radio stations is governed by a number of factors, which must include interference conditions, antenna characteristics of sender and receiver, and international or federal regulations, as well as the absorptive or other qualities of the media through which transmission is effected. Since in the average station one or more of these factors are not fixed by design, it has been customary to build instruments having a considerable range of wave-length and to select the most suitable adjustment after the stations have been erected and placed in operation. Sometimes, however, all the conditions which govern the choice of wave-frequency may be predetermined, and in such instances it is interesting to consider just how much the efficiency of transmission is affected by what lies between the two installations being investigated.

On page 326 of the present issue Mr. A. S. Blatterman discusses the quasi-theoretical determination of optimum wave-length in wireless telegraphy. His conclusions are based upon a study of the Austin-Cohen radio-transmission equation as graphically solved for distance in terms of wave-length, antenna height and antenna current. Obviously the results drawn from such consideration can apply only to the effects of the media of transmission, but even when so limited the conclusions have a marked degree of interest to radio engineers. Mr. Blatterman's assumption of constancy of antenna current when the wave-length is changed and the applied power held invariable cannot be accepted for all cases, yet it is true that many antennas have a nearly constant effective resistance for a large range of wave-lengths above twice the fundamental. For such aerials the results from the transmission equation may be applied with little modification, while for others a determination of the relative magnitudes of current and of transmission efficiency changes with wave-length will show at once how much importance may be attached to the selection of a wave-frequency having minimum absorption.

Certain curves in the present article show graphical solutions for distance as a function of the wave-length. From Fig. 7 it may be noted that, so far as the transmission expression determines the relation, the optimum wave-length is independent of all of the quantities except the distance. This result may be considered as further evidence that results of this sort have to do only with the media of wave propagation, and, even then, with only those of which the absorption coefficients are known. The results derived by the author have been confirmed in part by experiments of Prof. A. H. Taylor.

In applying the curves and equations given in the present article it should be noted that the distances are expressed in statute miles and that use has been made of the numerical coefficients determined by Austin and Cohen. Where computations are intended to give an index for commercial radiotelegraphy, it is well to remember that, if the static interference at the receiving station is severe, antenna currents as great as 200 microamperes may be required to permit continuous reading of messages. It is also important that the choice of high antenna or high current with the indicated reduced value of the other factor is not purely one of investment versus running expenses, since there are involved the questions of increased atmospheric difficulties at the receiver as the height becomes greater, and of the changes in applied power needed to produce at the sender a given current strength in any type of aerial as the effective height and working wave-length are altered.

It is hoped that the continued publication of material such as Mr. Blatterman presents will result in the wider appreciation of the fundamentals of radio-transmission engineering, and that there will be brought forward from time to time experimental data which will be of value in confirming or overthrowing the present hypotheses as to absorption, reflection and refraction of long electromagnetic waves emitted by earthed oscillators.

The News of the Week

**Activities and Events in the Electrical Field—
Reports of Meetings—Commission Findings, Etc.**

Suit to Enjoin Los Angeles Bond Issue

An action has been begun at Los Angeles, Cal., to enjoin the sale by the city, or the use of any part of the proceeds, of the issue of $6,500,000 "power" bonds authorized by the voters on May 8. The proceeds of the bonds were to be used for the completion of a hydro-electric generating station and the construction or acquisition of an electric distribution system. The complaint in the bill is that the city combined under one issue bonds for more than one purpose, and that while it was generally supposed that $1,250,000 was to be used for completion of the generating station and $4,250,000 for a distribution system, nothing in the ordinance compels such a division of expenditures. Before this action was begun the bonds had been held to be legal by a firm of attorneys.

Status of Water-Power Legislation

The Adamson bill, which was passed by the House last week, has been referred to the Senate committee on commerce, but no action has been taken on it as yet owing to the mass of emergency work before the Senate as a consequence of the European war.

In the absence of Senator Clarke, of Arkansas, Senator Simmons, of North Carolina, is acting chairman of the committee on commerce. It is stated at Senator Simmons' office that it has not been decided whether or not there shall be Senate hearings on the bill. The question is under consideration.

Representative Foster has reported from the rules committee of the House a special rule providing for the early consideration of the administration's four conservation bills. But he has provided an amendment that the consideration of these bills shall not interfere with the consideration of any measure relating to war tax revenues or the bonded debt of the United States.

Hearing on Separation of Washington Utilities

The committee on the District of Columbia of the House of Representatives held a hearing on Aug. 6 on a bill which directs the separation of the Washington Railway & Electric Company and the Potomac Electric Power Company of Washington, D. C. The following appeared before the committee: Mr. Clarence P. King, president of the Washington Railway & Electric Company; Mr. W. F. Ham, vice-president; Capt. Charles Holm, of New York, counsel for the company; Mr. Paul M. Lincoln, of Pittsburgh, and Mr. A. K. Baylor, of New York. The Washington Railway & Electric Company owns a controlling interest in the Potomac Electric Power Company.

The principal event of the hearing was the unexpected proposition advanced by Representative Prouty, of Iowa, a member of the committee, that the two companies, instead of being forced by an act of Congress to separate, be allowed to consolidate. The railway officials, including Mr. King and Mr. Ham, said that in their opinion such an arrangement would be agreeable to the companies. Mr. Ham, in his testimony before the committee, opposed the contention of the Public Utilities Commission of Washington that the Washington Railway & Electric Company has not maintained a proper depreciation account.

Mr. Ham informed the committee that since 1902 the dividends paid by the company have averaged only 2.8 per cent. They have been larger of recent years. Mr. Ham questioned the expert knowledge of the commission to prescribe what should be a proper depreciation account for a railway company.

Referring specifically to Representative Prouty's suggestion of a consolidation of the two companies, Mr. Ham declared that he believes that the time is not far distant when the advantages will be realized of consolidating all the railway companies and the Power company of the District of Columbia. He said this would settle "the transfer problem" once and for all and would give the companies a sound financial basis, with the prospect of going forward to meet the demands of future growth in the capital.

Recommendations of Committee for London Electricity Supply

As a result of the report submitted by Messrs. Merz and McLellan in regard to the supply of electrical energy in London, which was discussed in the *Electrical World* of May 2, May 9 and June 13, 1914, the special electricity committee of the London County Council has made public its conclusions on this subject. The committee concludes that from the point of view of dealing in the most satisfactory manner with the needs of London in regard to the supply of electrical energy and with due regard to future developments effect should be given gradually to the technical conclusions contained in the report of Messrs. Merz and McLellan.

It is the belief of the committee that a new authority, or controlling body, should be created which should probably contain representatives of the London County Council, the five other county councils and the three county boroughs concerned. The principle of the scheme outlined by the committee is that the machinery to be set up with the object of bringing the new undertaking into existence should provide for a combination of municipal ownership and control with private operation. The committee is of the opinion that the efficient and profitable working of the undertaking in the interest of all concerned will be secured most effectively by the adoption of an arrangement under which the capital shall be provided in definite proportions by the authority and a company. The company would have possession of the whole of the undertaking, including any undertakings acquired for a definite period, subject to full powers of control and supervision by the authority. The authority should advance as a loan two-thirds of the capital required for additions and betterments, while the remaining one-third should be furnished by the company. It is suggested that the whole of the money required for the transfer of exist-

ing undertakings should be provided by the authority. The authority would be empowered to resume possession of the undertaking at the end of the term of the contract on payment to the company of a sum equal to the capital provided by it for the purposes thereof. The arrangement provides for complete ultimate ownership by the authority.

The committee emphasizes that its scheme represents a combination of municipal and private enterprise designed to insure full control by, and an adequate share of profits to, the public with the flexibility and commercial enterprise of company management.

War-Time Possibilities of Electrical Export Trade

BY T. C. MARTIN

At the present moment, owing to the frightful war which is now being waged in Europe and which has sealed the outlets of our leading competitors, it would seem as though opportunity were knocking at our doors in respect to American export trade more loudly than it ever knocked before; but it will probably be some time before the exact conditions under which new trade can be developed will make themselves apparent. Never since the Napoleonic days has the world been confronted with such problems in the readjustment of its affairs, and even he who would be most adventurous must be reasonably cautious. It stands to reason, first of all, that if we are going to do a larger export trade we must at least have the ships in which to place the goods, so that over and above all necessities looms that of the immediate rehabilitation of the American mercantile marine. At one time our flag was seen on every sea and a large proportion of the world's commerce was carried in American bottoms. Latterly to see an American flag in a foreign port has been so rare in occurrence as to give a shock.

As to the electrical export trade, it has reached as high as $25,000,000 a year in strictly electrical goods. There seems no reason why this electrical figure should not be easily surpassed in the near future. During the past year or two there has been a tendency to a decline in these figures, but this may be regarded as a sympathetic falling off, due to the general reduction in the volume and value of world trade as a whole. So far as electrical apparatus exported is concerned, it is fortunate that the countries now involved in war have in reality been our smallest patrons, chiefly owing to the operation of protective tariffs. This is not true of England, but there we come in contact and competition with the material exported from Germany, and apparently we could not stand the brunt of its competition, this being especially true of incandescent lamps. It is a matter to be deplored that during the past few years the published statistics of the Department of Commerce and Labor as to export trade have been utterly useless as any indication of the destination of electrical apparatus shipped from this country. At one time the statistics were given in great detail as to our principal and even our minor customers, but this practice has virtually been dropped; and even as to the apparatus itself, more of it is lumped together under the one broad category of "all others" than is mentioned as specific produce. Under such circumstances it is extremely difficult to form an intelligent idea and offer any pertinent suggestion as to the present course of export electrical trade and what is best to be done.

The fact remains, however, that we have fared best in the neutral markets of the world, and with the closure of the productive centers of Europe the cessation of demand there affects so small a percentage of the $15,000,000 or $20,000,000 we are now sending out that it might easily be forgotten. Canada has been one of our best customers and we still have access to her markets. Japan has been a very good customer. Mexico has been an extremely good customer and even at the present time is probably taking much electrical material from us. We have also exported heavily to South America, the Cape (South Africa), East Indies and China. Possibly England, as soon as she has reasserted her supremacy of the seas, will be doing a fairly large export trade again, but it would seem that all supplies from Germany, one of our chief competitors, must be entirely cut off for some time to come. There are latent possibilities in Italy, whose connections with South America are far more considerable than is generally understood in this country; but Italy has never been a great exporter of electrical apparatus, and the whole market outside of Europe, and even that in some of the European countries not involved in war, would appear to be ours if we are willing to go after it. When peace is restored we may not be able to retain all the trade we have secured, but much will be retained.

It is a matter of deep grief and to be deplored that all Europe should thus be plunged in war and that all her energies should be devoted to the destruction of human lives and property; but the war is not of our making or wishing, while, on the other hand, it is not less a duty than an opportunity for us to supply the whole world with the electrical apparatus and material which are to-day prime necessities of civilization. If, as is probable, electrical export trade of the last year has reached a total of $20,000,000, it should certainly amount to $40,000,000 or $50,000,000 during the next twelve months. Not only has the opportunity presented itself for the sale of standard apparatus, but through the new channels opened up we should be able to supply a great many of the diverse electrical devices and appliances for which the demand will grow in proportion as they become known. At the present time it is amazing how few of our electrical manufacturers, numbering at this time not far short of 1000, are known in the markets of the world by name or by their apparatus. Owing to the lack of shipping and banking facilities and the fact that we have encountered the splendid competition of such countries as England and Germany, this lack of recognition abroad has been rather a misfortune than a fault, but now or never is the time to cure whatever is wrong.

Reference has been made to banking facilities. I believe it is fairly well understood here that one of our difficulties has been the fact that generally Americans do not extend long credit in international commerce. If I am correctly informed, English or German electrical apparatus, particularly the latter, has been sold on twelve to eighteen months' time, and I have myself known of cases where twelve months has been a usual period in the West Indies. Such conditions do not coincide with American methods of the turn-over of capital. But we may have to meet this problem instead of trying to collect cash before the goods are shipped. The German method seems to have resulted in such financing of manufacturing concerns that the banks have literally owned them and have possibly tried to operate them. This can hardly be for the good of the manufacturer in the long run, but it has certainly assisted Germany in the wonderful expansion of her foreign trade that has marked the last twenty-five years. There seems to be danger in it, and it also seems possible for an American financial and manufacturing genius to find a better way out. To our friends in Latin America we have at least shown that we have no selfish ambitions as to the acquisition of territory. But we do want their trade on some reciprocal basis, and they undoubtedly will help us to find the way.

The Export Trade in Electrical Machinery and Apparatus of American Manufacture

During the twelve months from July 1, 1912, to June 30, 1913, American electrical manufacturers exported to the markets of the world electrical machinery and apparatus to the value of over $26,000,000. This included generators, motors, fans, lamps (both incandescent and arc), telephone and telegraph instruments and appliances, and such miscellaneous articles as household appliances, switchboard apparatus, meters, etc. Canada received from the United States electrical goods to the value of nearly $9,000,000. Great Britain and Ireland took almost $1,500,000 worth, and France took about one-fourth as much. The exports to Germany were over $200,000. In fact, the exports to the countries now at war were somewhat more than $2,225,000, or, in other words, one-tenth of our total electrical export trade. We, therefore, export to the countries not at war, as well as to the colonies of those countries now at war, nine-tenths of the electrical goods which leave our shores.

This goes to show that the American electrical manufacturer has established his firmest market in ports that are at present either neutral or distant from the scene of fighting. To those markets, therefore, shut off from the countries at war, we must supply not only the same volume of exports as formerly but also the additional trade which they have been accustomed to expect from Europe but which they now lack.

TABLE I—VALUE OF AMERICAN ELECTRICAL EXPORTS TO COUNTRIES NOT AT WAR (FROM JULY 1, 1912, TO JUNE 30, 1913)

Country	Motors and Generators	Fans	Lamps, Arc and Incandescent	Miscellaneous, Including Telephone and Telegraph Apparatus
Denmark	$2,175	.....	.....	$9,451
Finland	4,686	.....	.....	7,759
Greece	600	$930	$135	5,131
Italy	68,258	1,860	2,137	121,783
Netherlands	4,111	387	110	41,960
Norway	2,156	.....	.....	13,787
Portugal	1,568	.....	2,189	9,037
Spain	62,930	579	420	308,065
Sweden	5,976	121	.....	5,795
Switzerland	365	.....	.....	1,315
Turkey	.....	.....	.....	3,219
Costa Rica	14,632	266	4,690	64,448
Guatemala	6,929	131	1,420	28,042
Honduras	3,226	65	751	14,801
Nicaragua	3,702	.....	420	8,280
Panama	354,890	1,483	12,956	1,017,298
Salvador	4,254	248	8,186	25,405
Mexico	607,503	5,591	175,935	1,209,253
Cuba	370,109	6,818	50,800	754,667
Danish West Indies	90	.....	.....	2,097
Dutch West Indies	1,771	.....	60	2,606
Haiti	.....	201	908	9,245
Santo Domingo	6,211	620	3,744	158,646
Argentina	99,044	53,300	47,371	376,070
Bolivia	5,458	43	116	5,942
Brazil	286,253	20,339	134,419	2,499,453
Chile	120,074	426	92,955	205,715
Colombia	20,725	844	8,108	124,494
Equador	3,537	85	5,344	32,037
Dutch Guiana	.....	.....	10	27
Paraguay	.....	.....	.....	307
Peru	192,104	234	16,327	171,896
Uruguay	19,508	6,493	5,733	50,399
Venezuela	13,064	255	7,675	95,807
China	20,636	24,613	7,084	67,909
Japanese China	1,561	200	.....	22,315
Korea	13,641	14	.....	35,587
Dutch East Indies	.....	.....	.....	1,961
Japan	1,248,750	10,474	4,783	1,102,828
Siam	4,113	847	55	9,047
Philippines	62,658	8,281	12,383	368,240
Portuguese Africa	4,292	.....	2,251	16,400
Egypt	760	600	.....	1,623
Liberia	.....	.....	.....	1,351

If a study of the accompanying tables is made, it will be seen that we send to the ten South American republics—Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela—annually close to $5,000,000 of electrical goods, or two-tenths of our total electrical export trade, or more than twice the value of electrical exports to the European countries at war, or approximately one-fourth of the export trade of the world at peace and the colonies of those countries at war.

Considering now the Central American republics, including Cuba, it is found that the electrical exports to our southern neighbors amounted to slightly more than $5,750,000, or over two-tenths of our total exports. This figure, it will be noticed, exceeds the value for South America by more then $750,000. This, of course, is to be expected, with railroad facilities into Mexico and with the construction of the Panama Canal.

Thus it will be seen that the exports of American electrical manufacture to the remainder of the American continent amount to approximately $19,750,000, or more than three-quarters of the total electrical exports.

TABLE II—VALUE OF AMERICAN ELECTRICAL EXPORTS TO COLONIES OF COUNTRIES AT WAR (FROM JULY 1, 1912, TO JUNE 30, 1913)

Country	Motors and Generators	Fans	Lamps, Arc and Incandescent	Miscellaneous, Including Telephone and Telegraph Apparatus
ENGLAND:				
Gibraltar	.....	.....	.....	$118
Bermudas	$477	$130	$1,933	18,617
British Honduras	1,150	.....	.....	4,298
Canada	1,618,356	131,848	160,715	6,784,614
Newfoundland	22,167	.....	5,218	54,477
Barbados	.....	.....	.....	5,660
Jamaica	3,241	406	1,967	26,325
Trinidad	2,495	195	1,007	9,532
Other British West Indies	927	139	416	4,166
British Guiana	3,826	82	1,650	10,671
British China	.....	.....	.....	.....
British India	108,111	36,965	2,135	317,421
Straits Settlements	.....	529	.....	3,772
Other British East Indies	5,807	2,093	.....	3,629
Hong Kong	12,355	9,393	.....	28,535
Australia and Tasmania	382,026	6,211	41,688	684,950
New Zealand	9,393	37	3,975	203,323
Other British Oceania	.....	.....	.....	366
British West Africa	.....	.....	.....	2,762
British South Africa	81,556	2,448	19,070	271,425
British East Africa	.....	.....	.....	53
FRANCE:				
French West Indies	88	.....	107	239
French Oceania	518	.....	22	7,496
French Africa	4,168	.....	.....	466
GERMANY:				
German Oceania	262	.....	.....	423

That we should have the bulk of our foreign trade with our neighbors is to be expected. Transportation charges are less, thus giving the American manufacturer the upper hand in competition, and the American goods, being nearer, could be delivered more quickly, especially in the case of Canada and the Central American republics. But the surprising fact is that but one-quarter of our electrical exports find their way across the ocean.

Exports to countries not at war have a yearly value of very nearly $12,500,000. These figures do not include the colonies of the countries now participating in the great European strife. It is thus seen that approximately one-half of our electrical goods are sent to ports which are now neutral. These ports, of course,

are scattered all over the world, from China to Italy, from Sweden to South America.

The yearly exports to the colonies of the countries now at war have a value of over $11,000,000, which is indeed very close to the amount exported to the neutral ports. In fact, our electrical commerce might be broken into two parts which are very nearly equal, one being that with the belligerent nations and their colonies and the other being that with neutral nations.

English colonies stand first in amount of electrical machinery and apparatus taken from this country by the colonies of the warring nations. The exports to British colonies have a yearly value of over $11,000,000, which is practically the entire amount of the exports to the colonies of Germany, England and France. French colonies take electrical goods to the value of over $13,000, and German colonies take less than $1,000.

Such figures can convey but one meaning in the light of present conditions. Germany has always been keen to develop the export trade to her own colonies. It has been one of Germany's ambitions to supply German colonies with goods of German manufacture. Germany at present is not able to furnish protection to German goods on high seas. Her navy is not sufficient to

TABLE III—VALUE OF AMERICAN ELECTRICAL EXPORTS TO COUNTRIES AT WAR (FROM JULY 1, 1912, TO JUNE 30, 1913)

Country	Motors and Generators	Fans	Lamps, Arc and Incandescent	Miscellaneous, Including Telephone and Telegraph Apparatus
Great Britain and Ireland	$497,739	$20,083	$22,782	$933,379
Germany	54,630	702	2,309	157,715
Austria-Hungary	5,138	465	20	18,040
Servia	.....	.....	.....	.....
France	102,189	300	5	279,281
Russia	10,382	.....	468	46,622
Belgium	3,453	465	7,143	142,266

cope with the combined navies of England, France and Russia, both as fighting machines and as protectors to shipping. Her navy must be used purely for meeting the enemy and defending her harbors. As a consequence her foreign trade, which by the way was Germany's big asset, necessarily was stopped. Her vessels remain idle in neutral ports.

However, this is a time of progress. Wars cannot stop the commerce of the world as long as a neutral nation exists. The United States must take up Germany's trade. The American manufacturer must supply the world with the goods which Germany formerly supplied it.

The present crisis does not offer the same opportunity to acquire the English or French export trade, for the reason that these countries are capable of affording their commerce adequate protection on the seas. Their volume of trade, however, will be materially lessened inasmuch as their home industries will not be able to keep up the supply.

Germany, aside from being unable to export what she has on hand, will with her immense mobilization be unable to keep up the output of her factories.

German and English goods have so far met with the best success in South America. It is there that the American electrical manufacturer will probably strike his first blow for the worldwide supremacy of American goods.

Subsequent issues of the *Electrical World* will contain tables showing the trade of the belligerent countries with their colonies and the countries not at war.

Mr. Coster on Present Export Trade Conditions

Mr. Maurice Coster, manager of the foreign department of the Westinghouse Electric & Manufacturing Company, discussed with a representative of the *Electrical World* conditions arising from the European war. He said that if competitive manufacturers of electrical apparatus in Germany were handicapped by the war there would necessarily be a substantial and lasting advantage to American manufacturers in this industry. There is no reason to believe that those markets in the world which have been served by German electrical manufacturers will refrain altogether from consumption during the disturbance in Europe. The needs of these consumers cannot be supplied anywhere else under present conditions than from the United States.

So far as the United States is concerned, one of the definite results of the war is that the people generally, the bankers and the leading executives of manufacturing companies of all classes, are aroused more thoroughly than ever before to the very grave importance of developing a future export trade for this country. The steps taken by the National City Bank of New York and others promise to provide the financial means for carrying on an export trade from this country to Central and South America. Without the effective co-operation of the bankers the manufacturers are powerless to market their goods. Without the co-operation of the government the manufacturers will not find it possible to transport their goods in the present crisis from this country to those Central and South American countries which now furnish a natural market for American manufactures.

Mr. Coster referred to the strength of the banking connections between Central and South American nations and the large countries of Europe. He said that information concerning the invoices of American manufacturers had been given by German banks to the government of Germany and then transmitted by the government to German manufacturers. The disadvantage which this put upon American manufacturers will, of course, be ended under existing conditions.

Great promise for the foreign trade is seen by Mr. Coster in the organization of the Foreign Trade Council, which has been formed to promote the export interests of manufacturers in this country. As indicating the growing interest in the opportunities to develop export business, he referred to the organization of a new luncheon club in the financial district of New York, to be called "India House," which is designed for exporters, shippers and bankers especially interested in foreign commerce.

In referring to the need of government interest and co-operation, Mr. Coster said that the ways and means of shipment of goods to foreign countries had always formed a handicap to American manufacturers. Now for the first time the authorities at Washington see the importance of furnishing facilities to develop the merchant marine. The fact that the importance of this is appreciated by the authorities is in itself a long step in the direction of freeing American manufacturers from dependence on foreign shipping facilities. Temporarily the main countries of Central and South America will be crippled, Mr. Coster believes, by the European war. Heretofore most of the capital for enterprises in those countries had been furnished by Great Britain, France and Germany. The war will draw so heavily on the resources of the European coun-

tries that they will not be able to finance nations in Central and South America as freely as before, and those nations will have to look to the United States for capital. It will assist our bankers materially in developing close relations with countries to the south if the government will co-operate in every way to protect and promote the financing of South and Central American countries, also of legitimate enterprises. If bankers, for instance, should finance a South American country and have control of the import duties of that country given to them in order to protect their investment, the United States, in the opinion of Mr. Coster, should stand behind them in order to see that they have fair treatment.

Both Brazil and Mexico are very seriously embarrassed financially at this time. The rate of exchange is so high in those two countries that it is almost prohibitive for those who want to remit money. Enterprises in those two countries that under ordinary conditions showed handsome profits find to-day that if they try to send money to this country the cost is so heavy that their profits are turned into losses. If assistance is rendered by this country to place those countries on a sound basis financially in co-operation with the banks here, it will secure the good will of the people of those countries and at the same time be a material help to American manufacturers and exporters. Almost without exception it is the rule that the financial supporters of a country have its trade, and this government should do its part to strengthen the avenues of distribution for our manufacturers.

While Europe has always furnished a limited market for the products of electrical manufactures and some of the Central and South American countries will be affected so seriously by the European war that they will not be buyers for a time, yet there is a promising future in export trade for which this country should make careful and earnest preparation on a large scale.

Another point mentioned by Mr. Coster is that in case of armed conflict the government of Great Britain insures ships sailing under its flag against the risks of war. The premium demanded by marine insurance companies at the present time for such insurance is almost prohibitive, and this government should lose no time in stepping into the breach and doing for American manufacturers what Great Britain has always done for its manufacturers in case of war.

In emphasizing the work of the Foreign Trade Council and the systematic efforts which are being made at this time to promote export trade Mr. Coster spoke particularly of the work of Mr. J. A. Farrell, president of the United States Steel Corporation.

Effect of War on Western Electric Company

The operations of foreign companies associated with the Western Electric Company are naturally affected by the war. The factories in Belgium and France are closed because the employees have joined the war forces. The plant in England is still in operation and, so far as can be foreseen, it will continue in business. Although the company has connections of one kind or another in almost every nation of Europe, information as to the condition of the other plants has not been received.

The principal market for products of the Western Electric Company in foreign countries has always been in Europe, and the demands have been met in large part by the plants established in the various countries there. Telephone development has been very slow in Central and South America, and the amount of business transacted with consumers in those parts of the world has therefore been small. Owing to the close affiliations of some of these countries with European nations through the use of banking and shipping facilities their trade has gone mainly to those nations. It is the general expectation that some time will be required to reestablish the markets and banking facilities which were interrupted on short notice by the war.

The Western Electric Company will not suffer because of interruption to supplies of raw material. It is not dependent on foreign countries for any of its supplies of major importance.

A Traveler's Impressions of Electrical Conditions in Europe Just Before the War

Mr. E. W. Lloyd, general contract agent of the Commonwealth Edison Company and first vice-president of the National Electric Light Association, reached his home in Chicago, accompanied by Mrs. Lloyd, on Aug. 10, after two months spent in Europe and on the sea. Mr. and Mrs. Lloyd were among those who returned on the *Mauretania*, which put into Halifax, instead of New York, owing to wartime apprehension. They were glad to get back home, traveling at the last amid wars and rumors of wars and having difficulty in securing accommodations. Mr. Lloyd was welcomed enthusiastically by his associates in Chicago, and a great armful of roses, supported in a tall vase on his desk, gave notice of his return. Everybody was talking war at the time the *Mauretania* sailed from Liverpool, and the travelers felt that they got away just in time.

Mr. Lloyd attended the recent Philadelphia convention of the N. E. L. A. and sailed from New York on June 6. He visited Paris, Cologne, Berlin, Munich, Venice, Milan, Ugine, Berne, Strassburg, London, Newcastle, Edinburgh and Glasgow. To a representative of the *Electrical World*, who asked him what impressed him must during his trip, from the electrical point of view, Mr. Lloyd said that possibly he was most interested in the electric taxicabs in Berlin.

Electric Taxicabs of Berlin

In the German capital there are 600 of these electric cabs compared with 1600 gas-driven cabs and 2500 horse-drawn cabs. The electric cabs are regarded with favor by municipal authorities, owing to their speed, convenience and cleanliness. They can make 25 miles an hour. The city is issuing no more licenses for gas or horse-drawn cabs. Three horse-cab licenses may be exchanged for one electric-cab license. The batteries in these vehicles are owned and maintained by the Accumulatoren-Fabrik Aktiengesellschaft, from which fresh batteries are obtained by the owners of the cabs. The storage-battery company maintains large garages. When a chauffeur finds that his battery is nearly exhausted he drives up to one of these garages. Passing through the gate, his taximeter is read and he pays in the cash called for. He is then given a ticket, for which, in another department, he obtains a newly charged battery. The whole transaction can be carried out in two minutes, and thus the driver is not detained long from the street. Cab traffic is rigidly supervised by the city and all vehicles are carefully inspected. Electrical energy for charging the cab batteries is sold to the storage-battery company by the Berlin Electricity Works, the local central-station company. The average price paid at one garage is 1.4 cents per kw-hr. Strangely enough, there are few electric commercial vehicles in Berlin, and practically no private pleasure cars. The specialization has been all in the direction of taxicabs, and in the matter of using other electric vehicles Berlin has something to learn from Chicago and

other American cities. Mr. Lloyd noted the fact that the constant-potential system of charging storage batteries, comparatively new in Chicago, has been in use in Berlin for some time. The electric-cab system of Berlin possesses many interesting features, and Mr. Lloyd collected a mass of interesting information, which he has turned over to Mr. George H. Jones, of the Commonwealth Edison Company who is chairman of the electric-vehicle committee of the Association of Edison Illuminating Companies. Mr. Jones is preparing a paper on the subject for the Edison convention to be held at White Sulphur Springs, W. Va., on Sept. 14-17. This paper will contain data of interest to American electrical and electric-vehicle men.

Exposed Interior Wiring

Another subject to which Mr. Lloyd devoted considerable attention while in Europe was interior wiring, particularly the wiring in use where open work is permitted. The visitor noted the satisfactory use of Kuhlo, Stannos and similar brands of wire for this purpose. He had had the impression that these inexpensive types of wire were used only in fireproof buildings but such is not always the case. The use of these exposed, unobtrusive kinds of insulated wire is very common in all places where electric wire is open to ready inspection or is not subject to dampness. The use of these types of wire is not new, of course, but Mr. Lloyd thinks that central-station companies of the United States ought to co-operate with the underwriters to see if the two interests may not work together in some way to make safe wiring very much cheaper in this country. Reference is made to all cases where exposed wiring is permissible.

Ingenious schemes that have been developed by the foreign central-station companies to take care of small dwelling-house customers are worthy of careful study by American electrical men. Mr. Lloyd referred to this subject in his conversation with the interviewer, and praised the article on the subject by Mr. S. E. Doane, of Cleveland, entitled "Handling the Small Consumer in Europe," and printed in the *Electrical World* of May 23, 1914. However, it was pointed out that these expedients may need some modification for adaptation to American conditions and standards of living.

Varied Applications Where Europeans Are Ahead

In relation to electric heating and cooking appliances, Mr. Lloyd remarked that some of the foreign manufacturers, particularly in Germany, have shown progress in developing certain appliances of larger size, as bake ovens, kettles, large coffee urns, etc. The returned traveler also praised the artistic appearance of many of the electric heating and cooking appliances he encountered. The tasteful and pleasing appearance of conveniences or ornaments for the home adds to their desirability. Americans are excessively utilitarian, and their wares of this description contrast unfavorably with those made by those who know how to combine utility with some regard for art.

In foreign countries it was noticed that the gas-filled tungsten lamp is being pushed in smaller sizes than are usually seen in the United States.

Mr. Lloyd was impressed with the extensive use of electric furnaces in connection with the manufacture of ferro-alloys and steel. He concluded that the Europeans are far ahead of us in this industry. In Ugine, France, Mr. Paul Girod has two plants of this description which are very large, interesting and businesslike. Electrical energy is obtained from water-power, Ugine being at the foot of the French Alps. While Mr. Lloyd was in this place he was permitted to witness the casting of electric-steel breeches for guns and shells used with large high-power rifled guns.

Oldfield Bill Favorably Reported

The Oldfield bill for the revision of the patent laws was favorably reported to the House of Representatives on Aug. 12 by the House committee on patents.

The present bill is confined to three distinct abuses of the patent system: First, delayed applications in the Patent Office; second, the evils arising from the vendors of patented articles imposing on the purchasers thereof restrictions affecting the use of the articles or the price at which they must be resold to the public; third, the evils arising from owners of patents suppressing the same or prohibiting their use in order to prevent competition with other patented or unpatented articles sold by themselves.

Provisions of the Bill

The bill prevents patent applications from being drawn out to delays of fifteen years or so by providing that after the enactment of the measure applicants will be allowed only two years within which to present their cases to the Patent Office. Attention was called to the fact that by delaying answers to simple letters for months at a time applicants for important patents have obtained the protection of the "patent pending" law and have blocked competitors.

According to the Oldfield bill it will not be an infringement of patent laws for a dealer to sell a patented article at a price less than that prescribed by the manufacturers. In this respect it places patented articles on the same footing as unpatented articles. Should there be a dealer who disposes of his patented articles at a cut price, the manufacturer can no longer under the Oldfield bill bring suit for patent infringement. He will have to sue in a State court for breach of contract.

Hereafter a manufacturer will be compelled to grant licenses to anyone who wants to operate under a patent which the manufacturer has owned but not used for a period of three years. According to the committee many large concerns in the past have "shelved" patents in this way to prevent competition.

The Parcel Post and Electric-Vehicle Delivery

To central-station executives in the fifty largest cities of the United States the committee on parcel-post delivery of the Electric Vehicle Association of America, of which Mr. James H. McGraw is chairman, has sent detailed data showing the magnitude of the parcel-post traffic in each such city for a recent fifteen-day period. The combined figures for the fifty cities (which have a total population of over 25,000,000) show that nearly 11,000,000 parcels were mailed out from these fifty post offices during the interval from Oct. 1 to Oct. 15, 1913, while 3,500,000 parcels were received for local delivery during the same period. The average weight per parcel was 1 lb. 11 oz., and the average postage paid per parcel was 10 cents. Almost three-quarters of the total number of parcels handled were delivered by regular carriers without additional expense, while about 350,000 parcels (approximately 10 per cent) were handled by automobiles of one kind or another, at a total cost of $17,653, or about 5 cents per parcel. In the fifty cities for which figures were obtained one inhabitant in every seven received a package through the parcel-post service during the two-week period named. Besides the work already referred to, the committee is going ahead and collecting additional data on parcel delivery, the dates on which local transportation contracts expire, and the disposition of the local post office authorities toward the utilization of electric vehicles in the service.

Further Progress in Trust Legislation

The United States Senate, now considering the administration's proposed anti-trust legislation, has not been immune from interest in the war situation, and it is stated in Washington that the date for adjournment, which was put as probably Sept. 1, is likely to be postponed again. Discussion of the trust legislation may drag along for some time.

The latest report is that Congress will probably take a recess in the late summer or fall, certainly by October, and come back to finish the business before it by the opening of the new session in December.

Both the House and Senate have been obliged to consider a number of emergency measures in connection with the war in Europe. The necessity for the passage of these has prevented the Senate during the past week from discussing the two trust bills awaiting action. They are out of committee and ready to be taken up at any time, but the Senate has not been able to get to them. These are the Clayton anti-trust bill, passed by the House, and the Rayburn railroad security bill, also passed by the House.

When the Senate passed the Newlands federal trade commission bill last week it retained Section 5, relating to unfair competition, as amended by Senator Cummins, providing for a court review of decisions and orders of the trade commission in regard to unfair competition. An amendment was also incorporated in the bill, offered by Senator Pomerene, providing that all persons or corporations shall have the right to appear and be represented by counsel before any court in which the orders of the commission are sought to be enforced.

Two Democrats voted against the bill, Senators Thomas, of Colorado, and West, of Georgia. Twelve Republicans voted for the bill, as follows: Senators Brady, Idaho; Bristow, Kansas; Clapp, Minnesota; Crawford, South Dakota; Cummins, Iowa; Fall, New Mexico; Gronna, North Dakota; Jones, Washington; Kenyon, Iowa; Norris, Nebraska; Perkins, California, and Sterling, South Dakota.

The federal trade commission bill is now in conference between the House and Senate. The conferences began Wednesday, and members of the committee state that a week's time will be necessary for consideration of the measure. It is understood that the House conferees intend to make a strong effort to alter materially amendments to the bill made by the Senate. For one thing, the House objects to Section 5. That question was threshed out in the House when there was such a bill there.

It is also expected that when the bill finally does become law there will be a contest over the appointment of the five members of the proposed new commission. They will all have to be confirmed by the Senate, and it is expected that the views and records of possible appointees will be subjected by the Senate to an inquiry at least as searching as that accorded to the views and records of members of the Federal Reserve Board. The bill gives the appointment of the five commissioners to the President.

Chicago Electric Garage Owners Organize

A new organization has been established in Chicago to promote the use of the electric vehicle. It is the Electric Garage Owners' Association of Chicago, the present membership being said to consist of about forty owners of electric garages, manufacturers of electric automobiles or their representatives, and manufacturers of storage batteries or their representatives. The object of the new association is to promote the use and sale of electric vehicles from all points of view. The Chicago Garage Owners' Association embraces men interested in both gasoline and electric vehicles. It has three divisions—one relating to gas cars, one to electric vehicles and one to motor liveries. The men interested in the new association say that they are not opposed to the old organization, but that the interests of the electric vehicle can be furthered to better advantage by a separate association devoted exclusively to the electric vehicle rather than by a division or section of an organization serving both the gas and electric vehicle interests. The dues of the new association are $12 a year and meetings are held monthly at the Lexington Hotel. It is declared that 85 per cent of the electric garage owners of Chicago are members of the new organization. At present the membership is recruited almost entirely from men interested in electric passenger vehicles. However, commercial-vehicle men are welcome, although the number of commercial-vehicle garages is small.

The officers of the association are: President, Mr. H. S. Kesner, Royal Garage; vice-president, Mr. Harry Salvat, Fashion Garage; secretary, Mr. John E. Rhodes, Jr., Elite Garage, and treasurer, Mr. Otto A. Suttmueller, Hyde Park Hotel Garage. Subjects discussed at the meetings relate to a closer association of all interests connected with the electric vehicle, the legitimate charges to be made to owners, and the elimination of "cut-throat" competition in business. Standard flat rates recommended to be paid by owners are $35 a month for the smaller chain-driven electric passenger cars and $40 a month for the larger axle-driven cars of recent type.

Electrical Education for Window Trimmers

Mr. A. J. Edgell, who is in charge of the display-service bureau of the Society for Electrical Development, Inc., delivered an instructive talk on store-front and window illumination before the International Association of Display Men, formerly known as the International Association of Window Trimmers, at the Congress Hotel, Chicago, Aug. 5. Following the election of officers, it was announced that Mr. Edgell had been chosen second vice-president of the organization and also made a member of the educational committee. It is expected that through the latter office the campaign of electrical education for window trimmers which has been started will be vigorously continued.

Cincinnati Contract Extended Temporarily

The City Council of Cincinnati is considering a situation which arises from the operation of the Diamond Light Company without a franchise in some of the suburbs. An investigation is being made of the business of the Union Gas & Electric Company with the object of securing a change in rates. The city has extended its contract with the Union Gas & Electric Company for three months pending the results of the investigation.

Petition for Rehearing in Springfield Case Denied

The Missouri Public Service Commission has overruled the petition of the Springfield Gas & Electric Company for a rehearing of the electrical rate case. Mr. W. F. Woerner, a member of the commission, dissented from the conclusion of the majority. On reconsideration of the case he entertained grave doubts whether, all things considered, the commission has allowed the company sufficient valuation and an adequate return.

PUBLIC SERVICE COMMISSION NEWS

Illinois Commission

The city officials of Evanston, Ill., have complained to the commission that the prices for gas and electricity charged in that city by the Public Service Company of Northern Illinois are too high. The commission has ordered the company to submit an invoice and valuation by Sept. 15. Action on the complaint will be taken about the middle of October.

Ohio Commission

An answer filed to the Cleveland Electric Illuminating Company's appeal from an ordinance passed by the village of Lakewood requiring a 3-cent rate states that Cleveland now has an ordinance providing for this rate and that the village is by contract entitled to the same.

New York Commissions

Following weeks of careful work on the part of Mr. William McClellan, special engineer, and Mr. Daniel V. Murphy, special counsel to the Public Service Commission, Second District, in the investigation of the New York Telephone Company's metropolitan rates, the commission has announced its program of procedure.

Hearings will be resumed on Sept. 22 in the New York City offices of the commission. The commission has refused to assent to the plan of the New York Telephone Company, which involved the valuation of much property outside of the limits of New York City, and through a letter from Mr. Seymour Van Santvoord, chairman, has notified the company that it will not countenance delay which will put a final decision of the matter beyond Feb. 1, 1915. If necessary, the commission will hold continuous sessions in this matter after Sept. 22.

It has finally been determined by the commission that the investigation shall start with New York City alone and shall involve only those parts of the company's business outside the city which the actual investigation reveals from time to time as necessary for consideration in arriving at an equitable adjustment of the New York City rates.

The Second District Commission is rapidly cutting down the number of pending cases on its calendars. There were 948 formal and informal complaints pending before the commission on March 16 last. Despite the fact that 899 new cases have been filed since that time, the commission has decided 1177 formal and informal cases up to July 31, so that there are now pending but 670 cases of a formal and informal nature, or 278 cases fewer than on March 16. The commission disposed of 115 cases in the six weeks from June 16 to July 31.

Washington Commission

On the ground that the company enjoyed an exclusive franchise and that it is incumbent on it to furnish gas in all portions of the city of Seattle without an excessive charge, the Seattle Lighting Company was ordered by the Public Service Commission to extend its mains in West Seattle so as to reach the complainant in the case. The company originally protested against making the extension, declaring it would cost more than the derived revenue would warrant. It refused to serve the complainant in the case unless he paid $25 toward the cost of extending the gas main. An appeal to the commission was the result.

California Commission

An application has been filed by the Pacific Gas & Electric Company with the California Railroad Commission for a rehearing in the case involving electrical rates in Antioch.

Indiana Commission

In the summary of the work of the Public Service Commission of Indiana for its first fifteen months, ended July 31, it is shown by the chairman, Mr. Thomas Duncan, that 913 regular proceedings and 1727 informal proceedings took place. More than 20,000 schedules of rates and tariffs were filed. Of the regular proceedings 220 involved rates, 113 stock and bond issues, 40 station facilities and 29 the purchase and sale of utility properties. The chairman said one of the greatest tasks practically has been completed—the compilation of a complete list of the utilities under the commission's jurisdiction.

The forthcoming first annual report of the commission, which will be published soon, will show that rates of these utilities vary greatly. The summary of the report, made by the chairman, declares that the rates are grossly discriminatory. The prices for water range from 6 cents to 60 cents per 1000 gal.; electric energy, from 5 cents to 15 cents per kw-hr.; gas, from 55 cents (Indianapolis) to $1.50 per 1000 cu. ft. The chairman's summary said:

"More than $36,000,000,000 is invested in public service corporations in the United States. This is over one-fifth of the wealth of the nation. Those operating in this State represent an investment of over $2,000,000,000. Even in one state the control and regulation of these properties is a momentous task. The immediate future presents increasing difficulties. The steam railroads have had on file since Nov. 3, 1913, schedules increasing freight rates 5 per cent on all tonnage. The Interstate Commerce Commission has granted practically all of this increase. To determine properly whether this increase shall be granted or not in this State will require a great deal of information and a great deal of labor. The situation of the large telephone companies is very complicated. More than 2000 smaller utilities will require investigation and consideration.

"The regulation of public service corporations is neither unusual nor unjust. To establish a maximum rate of earnings on investment in utility properties is no more arbitrary than to establish a maximum rate of earnings for the money lenders of the State. Yet to prevent usury has always been deemed a proper exercise of legislative power. The people of the State have no more vital interest in any subject than in the public service corporations that provide the necessities of life and the means of communication and transportation.

"Every state in the Union but two has some form of commission for the regulation of public service corporations. No state that has ever enacted such a law has ever yet repealed it. The necessity of the law is not only for the protection of the public from the extortions of the utilities themselves, but it is of great value to the utilities themselves, in that it seeks to secure friendly co-operation between the utilities and the users of their service. It is not the object of the law to injure or destroy the utilities or the railroads, but, on the contrary, the sole purpose of those whose duty it is to administer the law is to do justice between the contending parties."

Idaho Commission

As a sequel to the hearing by Commissioner Standrod, of the Public Utilities Commission, on the complaint of the Idaho Millers' Association against the Utah Power & Light Company at Pocatello, the commission gave the company permission to put a new schedule of rates for motor service for millers into effect. The new rates are tentative, remaining in effect until Dec. 1.

Current News Notes

"Breezes All Day for a Nickel."—The Public Service Company of Western Kentucky, which owns and operates the electric plant at Fulton, Ky., is using much local newspaper space in popularizing the electric fan. "Breezes all day for a nickel" is one of the striking phrases used in its advertising.

* * *

Opening of the Panama Canal.—According to the announcement of the Secretary of War, the Panama Canal is to be opened to interoceanic traffic on Saturday of the present week. Conditions at the Cucaracha slide limit the use of the canal for the present to vessels drawing 30 ft. or less, but this restriction will affect none of the vessels regularly plying on the Panama route.

* * *

Electric Trucks for New Orleans Docks.—The New Orleans Dock Board has closed a contract for central-station energy to charge six electric trucks which will be used for haulage service on the local waterfront. The decision to use electric trucks followed after an actual demonstration of the speed and convenience with which these vehicles could be loaded and unloaded. The docks are also to be equipped with an electric conveyor system.

* * *

Safety First at Salt Lake City.—The Utah Light & Railway Company, Salt Lake City, Utah, arranged a special meeting of all its employees for Aug. 12, when Mr. E. M. Bagley, the company's claims attorney; Mr. L. E. Abbott, commissioner of safety for the Oregon Short Line Railroad, and members of the Utah Light & Railway Company's safety committee were to give illustrated talks and demonstrations on the "safety first" movement. Two sessions were necessary in order to accommodate all of the company's employees.

* * *

Committee on Awards, Electrical Development Society Prize-Story Contest.—Messrs. Edmund L. Pearson, editor of publications, New York Public Library; F. J. Urquhart, assistant editor Newark (N. J.) *Sunday Call*, and J. M. Wakeman, general manager of the Society for Electrical Development and former vice-president and general manager McGraw Publishing Company, publisher of the *Electrical World*, have been named as the committee on award in the prize-story contest of the Society for Electrical Development. Competition in the contest, which closes Sept. 1, is open only to employees of members of the society, and prizes of $250 to $10 are offered.

* * *

Electric-Lighted Map Showing Warring European Forces.—A large electrically illuminated map showing the positions of the forces engaged in the European war has been erected on the Herald Building, New York City, where it can be seen by everyone reading the war bulletins displayed by that newspaper. The map is painted in colors and is illuminated by three pairs of lamps provided with separate bulletin-board reflectors suspended in front of the canvas. Cities which have become of unusual interest since the conflict started are spotted on the map, and small silk flags representing each nation at war are stuck in the map to indicate where the various naval and military forces are located.

* * *

"Vacation Comforts."—The Society for Electrical Development, Inc., 29 West Thirty-ninth Street, New York City, has prepared an attractive 4-in. by 9-in., twelve-page booklet entitled "Vacation Comforts," in which are described the summer electrical conveniences proffered for the comfort of those vacationists who stay at home as well as the ones who seek seashore and mountain delights. Electric fans, heating and cooking appliances and motor applications are described and pictured, and emphasis is laid on the fact that electric service is to-day available in many hotels and boarding houses, so that the electrically equipped summer traveler need not be denied the comforts of his own well-appointed home.

* * *

Something New in Safety Valves.—The following instructive reference to the subject of engine design is quoted from an editorial entitled "A Safety Valve for an Engine—Free Speech for a People," in a recent issue of the New York *Evening Journal*, copyrighted, 1914, by the Star Company. "A little boy invented the safety valve for engines. It was his business to watch the steam pressure and let the steam off when the pressure got too high. But he wanted to play at marbles and other games free from worry. And he invented the safety valve, the whirling apparatus on the top of the steam engine, which, by the power of centrifugal force, wedges apart the two revolving balls and lets the steam escape automatically when the pressure gets too high."

* * *

Town Dark; Crops Saved.—The town of Jewell, Ia., is in temporary darkness as a result of the record crops waiting to be threshed in that section, according to the Waterloo (Iowa) *Times-Tribune*. The tractor engine which has been furnishing power to operate the electric-light plant was needed last week in the wheat fields, so the owner drove the machine away from the station, leaving the housewives to resurrect coal-oil lamps and hunt supplies of candles. Some time ago the engine at the electric plant broke down and the tractor was then temporarily pressed into service while the station equipment was undergoing repairs. The threshing season came on, however, before the new building was finished, and Jewell's electric-light plant had to be motored away to more lucrative work than grinding out kilowatt-hours.

* * *

SOCIETY MEETINGS

New York Section, E. V. A.—A New York Section of the Electric Vehicle Association of America is to be formed at a meeting scheduled for Aug. 20 in the auditorium of the New York Edison Company, Irving Place and Fifteenth Street, New York City.

* * *

Convention of Southeastern Section, N. E. L. A.—As noted in our issue of July 25, the annual convention of the Southeastern Section of the National Electric Light Association will be held at the Isle of Palms, near Charleston, S. C., Aug. 19 to 21. Mr. A. A. Wilbur, Columbus, Ga., is secretary of the association.

* * *

Indianapolis Jovians Entertain Celebrities.—James Whitcomb Riley, the "Hoosier poet," Governor Samuel M. Ralston of Indiana and Mayor Joseph E. Bell of Indianapolis were the guests of Indianapolis members of the Jovian Order at a luncheon held Aug. 3 at the Hotel Severin, Indianapolis. Mr. Thomas A. Wynne, vice-president of the Indianapolis Light & Heat Company, presided as toastmaster, and there were addresses by the guests, the talk by Mr. Riley being the first which the invalid poet has delivered in five years.

Single-Unit 5000-kw Steam Plant at Alton, Ill.

Prime-mover apparatus added to the system of the East St. Louis Light & Power Company—Water-power substation tying in with plant at Keokuk—Application of rotary condensers

AT Alton, Ill., there has just been completed another link in the growing chain of electrical properties served by the great hydroelectric station at Keokuk, Ia. (described in the *Electrical World*, May 31, 1913). Unusual interest attaches to the Alton relay steam plant and substation, not only by reason of its connection with the world's largest low-head hydroelectric development, but also on account of the engineering features which the local station itself contains. Even its location makes it interesting, for the buildings have been erected in a stone quarry bordering the Mississippi River and are so concealed behind the bluffs that the casual visitor might pass within a few hundred feet of the plant without observing even the top of its stack.

The plant consists of a steam station, substation and terminal house. The substation is designed to receive 6000 kw from the 66,000-volt lines of the Mississippi River Power Company. Operating in parallel with this substation is the single steam turbo-generator with a full-load rating of 5000 kw at 80 per cent power-factor. Plant and substation in turn operate in parallel with the Winstanley steam station of the East St. Louis Light & Power Company through the latter's Lake Avenue substation at East St. Louis, 27 miles distant, connection being made through tie-lines carried on steel transmission towers.

From this system the East St. Louis Light & Power Company supplies energy for lighting, motor and railway service at Alton, East St. Louis, Belleville and intermediate points.

A Turbine Station with a Single Generator

Foundations of concrete, walls of red pressed brick, and floors and roof of ferro-inclave concrete construction make the steam station fireproof throughout. All the windows have steel sashes and practically all the doors are of steel.

The station is divided into two compartments, an engine room and a boiler room, each being provided with a basement beneath. The engine room measures 42 ft. by 112 ft. and the boiler room 57 ft. by 96.5 ft. In the engine room is a 6250-kva, 6600-volt, twenty-five-cycle General Electric generator driven by a five-stage horizontal Curtis turbine operating at 1500 r.p.m. This machine, the neutral of which is grounded, is connected to a three-phase, 3125-kva auto-transformer, stepping the potential up to 13,200 volts. Thus the generator may be paralleled through a three-phase, 300-amp, 15,000-volt oil switch to the 13,200-volt bus in the substation. This 6250-kva machine at present represents the entire alternating-current generating equipment. However, the station is designed for an ultimate rating of 10,000 kw, and with but slight changes the plant can be arranged to give an ultimate capacity of even 20,000 kw. Practically two-thirds of the remainder of the

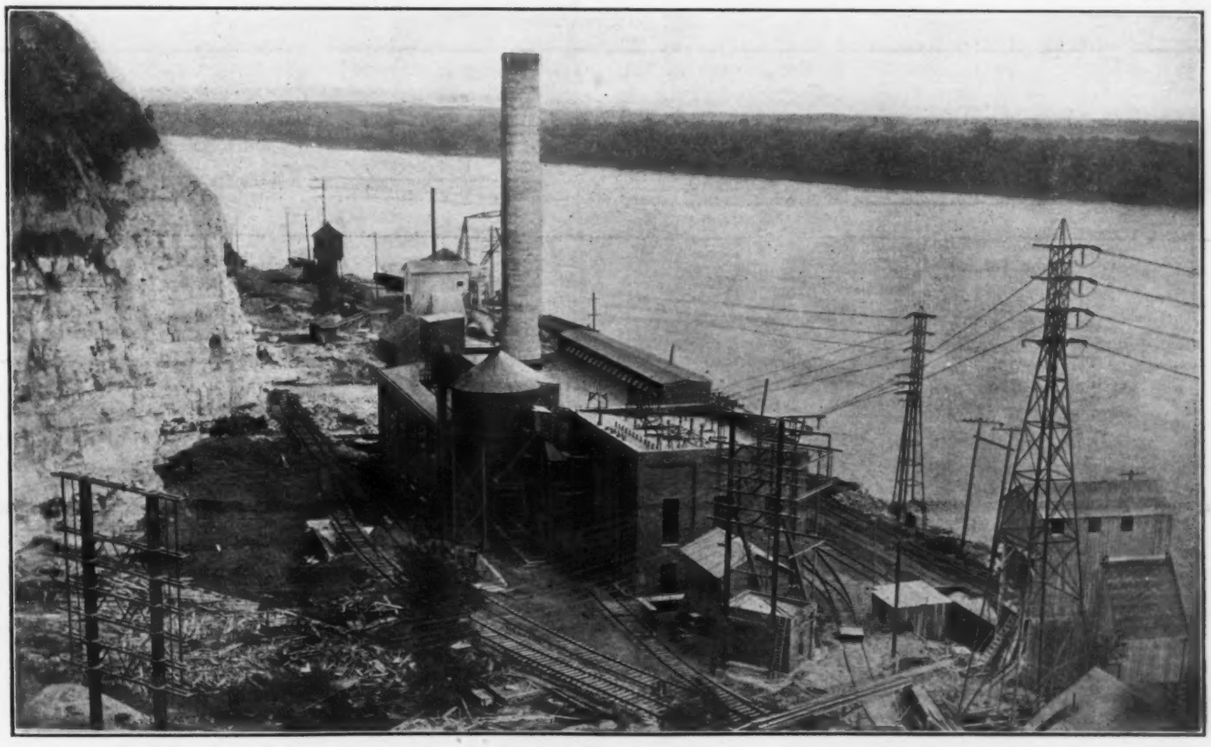


FIG. 1—GENERAL VIEW OF THE STEAM PLANT, SUBSTATION AND TERMINAL HOUSE, EAST ST. LOUIS POWER & LIGHT COMPANY, ALTON, ILL.

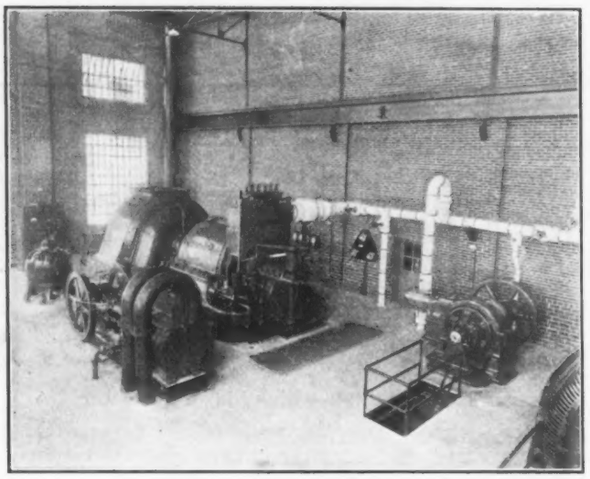


FIG. 2—NORTHWEST CORNER OF TURBINE ROOM, SHOWING 5000-KW TURBINE

engine room is occupied by a synchronous condenser, two frequency changers, two synchronous converters, two motor-driven exciter units, a steam-driven exciter, a 30-ton electric traveling crane, switchboards and control apparatus.

Variable-Speed, Vertical, Motor-Driven Pump for Circulating Water

An Alberger 8200-sq. ft. Spiroflo surface condenser is placed directly beneath the turbine and is connected to it by a 52-in. by 17-in. expansion joint. Circulating water supplied through a closed-siphon system is lifted from the Mississippi River by an 18-in. vertical centrifugal pump driven by a 100-hp, 250-volt direct-current variable-speed motor on the engine-room floor. This pump has a capacity of 9000 gal. per minute against a total head of 16 ft. when operating at 395 r.p.m. The speed of the motor may be varied from 350 r.p.m. to 700 r.p.m. as may be required by the load on the turbine or the stage and temperature of the river water. Since the channel of the stream at this point in the river is free from sandbars and other obstructions, the 18-in. intake pipe is fitted with flexible joints and laid directly on the river bottom. To prevent foreign matter entering the piping, the end of the intake is provided with a coarse screen and a twin strainer is placed inside the station.

The non-condensable vapor in the condenser is handled by a 12-in. by 30-in. by 18-in. rotative dry-vacuum pump, while a turbine-driven centrifugal hot-well pump removes the condensate from the condenser and lifts it to the overhead feed-water storage tank in the boiler room.

Since it was desired to use 250-volt direct current for motors driving the circulating pump, the coal-weighing hopper and the traveling crane, the exciter units installed are three-wire, 125-250-volt direct-current machines. There are three 75-kw exciter sets. Two are driven by 220-volt, three-phase, twenty-five-cycle induction motors, and the third is operated by a steam engine. Double exciter buses have been installed, so that a portion of the machines may be excited from one bus while the others receive their excitation from the other bus. In addition to supplying 125-250-volt energy for the direct-current motors and excitation for the larger machines these units furnish energy for the emergency station lighting. A storage battery, provided for operating the remotely controlled oil switches, also automatically supplies current for switchboard lighting when the voltage of the station falls below a predetermined limit.

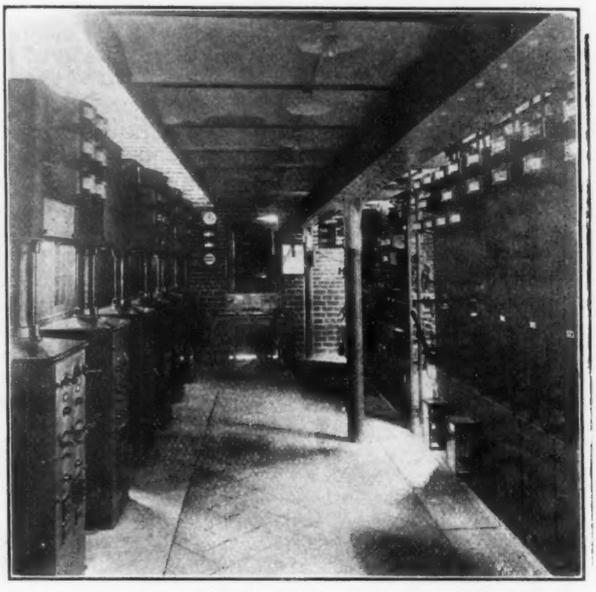


FIG. 4—PEDESTALS AND SWITCHBOARD

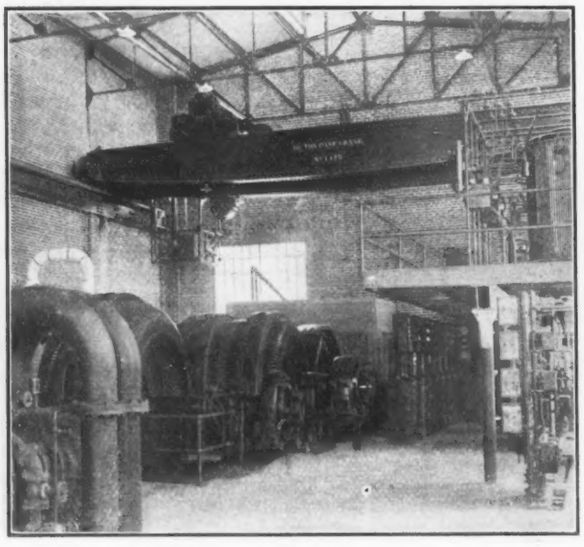


FIG. 3—SYNCHRONOUS CONDENSER AND FREQUENCY-CHANGER SET

Synchronous Condenser to Improve Power-Factor

The electrical apparatus in the station, aside from the turbine, exciters and necessary switchboards, might properly be termed substation equipment. However, since this apparatus is all installed in the steam-station building it will be described as a part of the contents of that structure.

The synchronous condenser already mentioned is a 13,200-volt machine connected to one section of the ring bus for the double purpose of maintaining constant potential and improving the power-factor. Frequency changers, rated at 500 kw and 1000 kw, are used for supplying sixty-cycle energy for motor service and lighting in Alton. Of the two 500-kw synchronous converters to be used for supplying the 600-volt direct current used for the railway service in Alton, only one is installed at the present time.

The switchboard of the station is divided into five sections controlling respectively the twenty-five-cycle,

13,200-volt and 66,000-volt equipment, the sixty-cycle, 2300-volt equipment, the direct-current 600-volt equipment, the arc-lamp circuits, and direct-current excitation equipment. In addition to these there is a twenty-five-cycle, 220-volt panel for the low-tension alternating-current circuits to the motor-driven auxiliaries.

Because of its marked departure from standard practice, the twenty-five-cycle switchboard controlling the 66,000-volt and the 13,200-volt equipments is of interest. This equipment represents a step beyond the "peek-a-boo" benchboard in that each panel is an individual pedestal, separated from its neighbor by a distance of approximately 4 ft. Seven of these pedestals with the synchronizing post have been installed. A post at the end of the row of pedestals supports a swinging bracket carrying a synchroscope, a frequency indicator and two voltmeters. One of the latter instruments can be connected to any section of the twenty-five-cycle buses, while the other can be plugged to any machine or to the outgoing lines. Switchboards for the sixty-cycle alternating current, the 600-volt railway feeders, the direct-current exciters and the synchronous condenser face the pedestal switchboard.

A balcony over these switchboards supports the oil

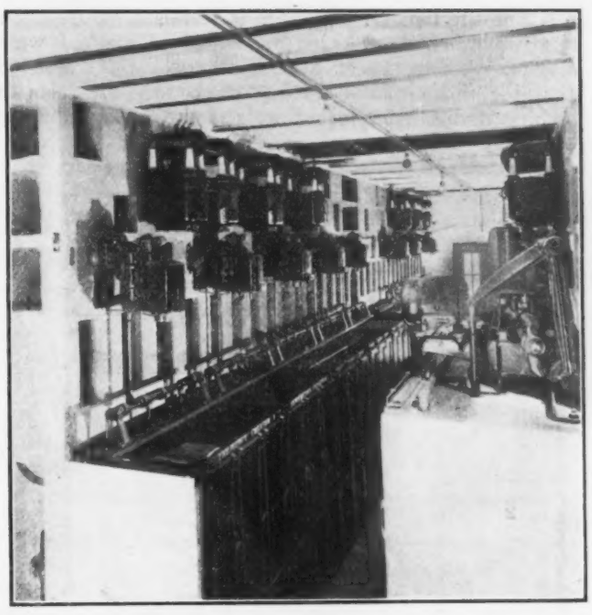


FIG. 6—OIL-SWITCH COMPARTMENT IN SUBSTATION

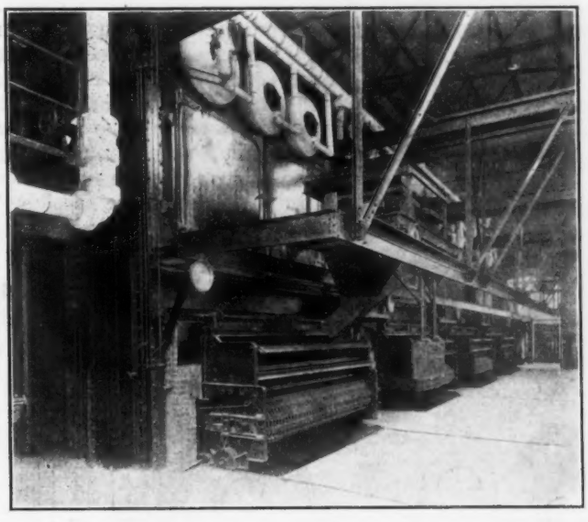


FIG. 5—BOILER ROOM, SHOWING COAL CONVEYOR

switches for the sixty-cycle, 2300-volt feeders, which are controlled from the switchboard beneath. This balcony also accommodates the transformers and switching equipment for the series-arc lighting and incandescent circuits.

Combining Natural and Induced Draft for Boilers

Four 440-hp Babcock & Wilcox boilers equipped with superheaters comprise the steam generating equipment of the station. This equipment is designed to operate at 100 per cent overload, thus making the total boiler rating 3520 hp. These boilers and superheaters deliver the steam to the header at 175 lb. gage pressure with 100 deg. superheat. All steam-driven units of the station are supplied from this header, so that all operate on superheated steam. Each boiler is equipped with chain-grate stokers driven by 3-hp, 220-volt, three-phase, twenty-five-cycle individual motors.

Two economizers having 4018 sq. ft. of heating surface each are so arranged that ordinarily the gases from two boilers will go through each economizer. The feed-water piping is connected so that the economizers operate in parallel. Under light loads a 12-ft. by 150-ft. concrete chimney will furnish the draft, but for heavier loads and quick firing a 18.5-ft. by 6-ft. induced-draft fan driven by a 12-in. by 30-in. Corliss engine will assist the chimney in its work. This fan will deliver 100,000 cu. ft. of air per minute when running at 100 r.p.m.

All Water Used Is Weighed

A gravity system delivers the boiler-feed water from a storage tank under the roof to a Hoppe exhaust-steam feed-water heater with 625 sq. ft. of heating surface. Ordinarily the water from this heater is pumped to the boilers by a 17-in. by 10-in. by 17-in. Worthington duplex pump of the outside-packed type. In case of light load or emergency, however, a 9-in. by 15-in. by 10-in. pump of similar type performs the work. This smaller pump during ordinary operation is used only for boiler washing. The feed piping is arranged so that the water may be fed to the boilers directly or through the economizers.

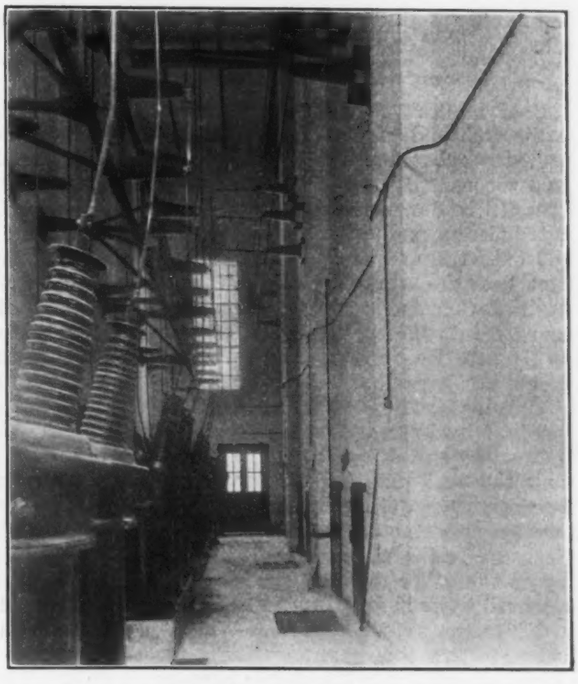


FIG. 7—HIGH-TENSION OIL SWITCHES IN SUBSTATION

All of the boiler-feed water is weighed before entering the storage tank by means of Hammond water meters. A 4-in. meter having a capacity of 75,000 lb. of water an hour takes care of the condensate from the turbine and a 3-in. meter weighs the make-up water.

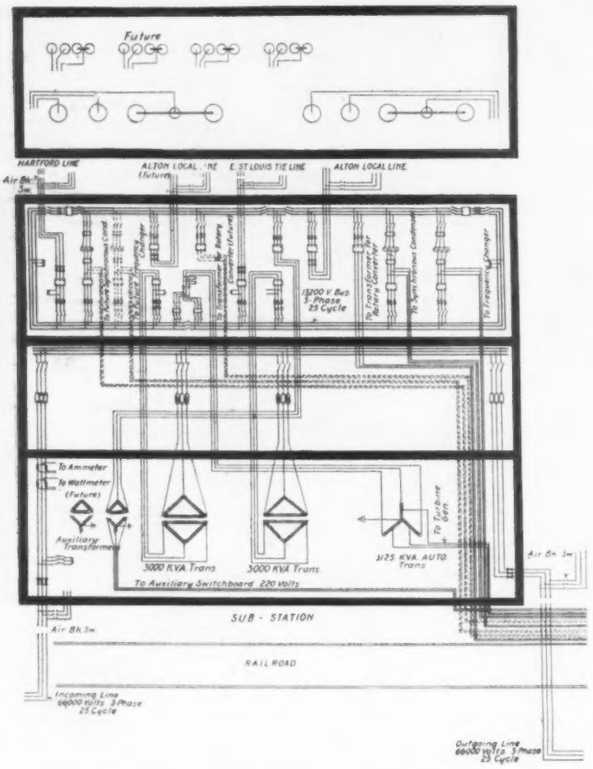


FIG. 8—DIAGRAM OF ELECTRICAL EQUIPMENT

Under ordinary operating conditions the make-up water is supplied by the cooling water from the turbine bearings and the dry-vacuum pump jacket. Provision is made, however, so that water from the house-piping system will automatically cut itself in through this 3-in. meter if the water in the storage tank falls below a certain level.

Provisions for Keeping Coal Records

Coal is delivered over the Chicago, Peoria & St. Louis Railroad to the company's double siding, which provides one track for cars of coal and one for the empty cars. By the grading of these tracks the full cars can be moved over the track hopper by hand without difficulty, and when empty the cars are allowed to roll onto the end of the track, being thence switched back onto the "empty" coal-car track to await the switch engine. Coal is received in dump-bottom cars and discharged into the track hopper, from which it is picked up by a flight conveyor and carried through a motor-driven crusher or direct to a bucket elevator, if the fuel is sufficiently fine. It is elevated into a 300-ton steel, concrete-lined storage tank placed just outside the station at the end of the boiler room. From this storage tank the coal runs by gravity into a 2-ton traveling weigh hopper driven by a 2-hp, 250-volt, 1250-r.p.m. direct-current motor, the control of which is effected by means of chains suspended within reach of a man walking on the boiler-room floor. This hopper travels on an overhead track in front of the boilers and discharges the coal into the stoker hoppers. Weighing apparatus attached to this hopper automatically records the amount of coal dumped into the stoker hoppers, thus keeping a record of all coal burned.

The fine coal and ash from the chain-grate stokers are carried by a chain-drag conveyor and bucket elevator to separate hoppers supported on the same steel structure with the coal-storage bin. The fine-coal bin is placed so that this coal can be discharged into the coal-weighing hopper and again fed to the stokers, while the ash hopper is placed above a track so that a coal car may be placed underneath it to receive the ashes.

A Boiler Test Every Day

It has been said of this station that no good reason can be given why a boiler test—or, for that matter, a complete plant test—should not be made every day. As stated above, all coal and water used are weighed. Thus, knowing the output of the turbine and the coal burned, it is very easy to check up the efficiency of the plant at all times. Besides these features numerous other instruments are provided to keep close check on the operating conditions of the station. Each furnace is fitted with an Ellison differential draft gage, while a combination indicating and recording draft gage is piped so that it may be connected to any or all of the furnaces.

Recording instruments have been installed to record the temperatures of the water from the storage tank, water from the exhaust heater (temperature of water to the economizer), water from each economizer, gases to each economizer, gases from each economizer, superheated steam at turbine throttle, exhaust steam from turbine, condensate from condenser and circulating water from condenser. The chart for the exhaust-steam thermometer is a combination temperature and vacuum chart. The temperature of circulating water entering the condenser is determined by an indicating thermometer since this temperature varies but little in a day's time.

Separate Substation Receives Energy from Keokuk

Erected at the west end of the steam station is a substation of the same general construction as the main

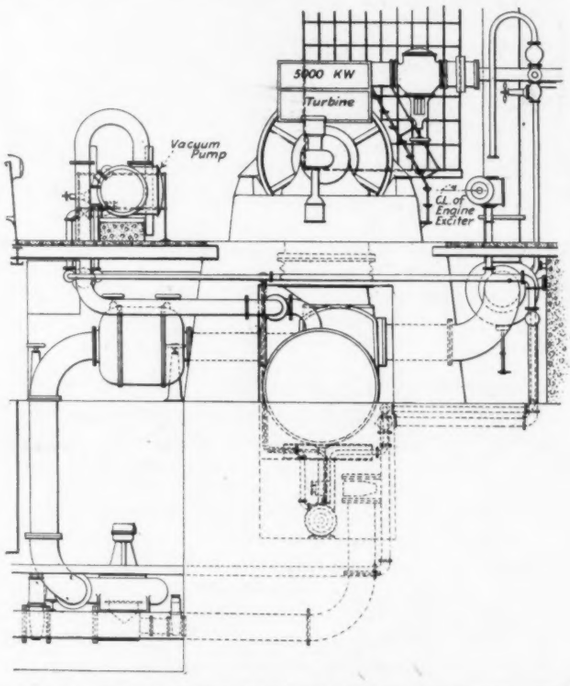


FIG. 9—CIRCULATING-WATER SYSTEM FOR CONDENSER

building. Incoming and outgoing 66,000-volt lines and the outgoing 13,200-volt lines terminate here. The outgoing 66,000-volt line is carried over steel towers to the company's substation at East St. Louis. However, this line is brought through the Alton substation so that all

of the 66,000-volt energy which the company receives from the Mississippi River Power Company may be measured. There are two 13,200-volt, twenty-five-cycle lines connecting this station with the East St. Louis substation, while two 13,200-volt, twenty-five-cycle lines leaving this station connect with local points. Of the local 13,200-volt lines only one is installed at present.

The substation itself is divided into three rooms—the transformer room, the 66,000-volt switch room and the 13,200-volt switch room. Lightning arresters for both the incoming and outgoing 66,000-volt lines and the outgoing 13,200-volt lines are installed on a balcony above the 13,200-volt switches. Two three-phase, twenty-five-cycle, 3000-kva transformers, a three-phase, twenty-five cycle, 3125-kva auto-transformer, and two 13,200/220-125-volt auxiliary transformers, with the potential and series transformers for the 66,000-volt metering equipment, compose the apparatus in the substation. In the 66,000-volt switch room a 66,000-volt oil switch connects the incoming line with the 66,000-volt bus, while one 66,000-volt oil switch connects this bus to the 66,000-volt outgoing line to East St. Louis and a 66,000-volt oil switch is provided for each of the two 3000-kva transformers.

The remotely controlled oil switches are all installed in the 13,200-volt switch room. By dividing the ring bus into four sections, two on each side of the room, and supporting these in concrete compartments, it has been possible to effect quite a saving of space. As will be seen from the cross-sectional view of the substation, the room containing this apparatus is but 13 ft. from wall to wall, yet the alleyway down the center is 3.66 ft. wide. The oil switches are located in the lower concrete cells, while the solenoid-operating mechanisms which control these switches are mounted on the front walls of the concrete compartments containing the buses.

Terminal House for Outgoing Lines

A terminal house in connection with a station of this size is in itself unique. All of the local 2300-volt, sixty-cycle feeders, the 600-volt direct-current railway feeders and the alternating-current arc-lamp feeders are carried in tile conduits from the steam station to a 14-ft. by 14-ft. terminal house which has been erected about 30 ft. from the substation. From this building, which houses the lightning arresters for these feeders, the lines rise to a steel tower erected directly over the terminal house, and from this point are carried on steel towers over the bluff, where they connect with the circuits of the city. The local 13,200-volt line is also carried on these towers.

The station at Alton was erected by the E. W. Clark & Company Management Corporation and will be operated by the East St. Louis Light & Power Company. Mr. K. B. Ward was construction superintendent during the erection of the station, having been assisted by Mr. G. W. McIver, electrical engineer, and Mr. H. H. Bailey, mechanical engineer.

Pole-Line Construction in the Philippines

Since few woods can withstand the tropical climate of Manila, the transmission-line poles used there and in other parts of the Philippines are preferably made of concrete or of some native close-grained wood. Among the native woods tried for this purpose only one, known locally as "ipil," seems to give satisfaction, for the others either decay or are eaten by white ants. Untreated American cross-arms begin to show signs of weakness at the end of the first year's service and in two years are usually entirely rotted away. Creosoted arms from the United States last from six to eight years.

Ipil is a hard, close-grained wood heavier than water. Although hard to handle, it is very reliable and exceedingly strong. When free from sap rot, it will last from twenty-five to thirty years. Posts of this wood fifty years old can still be found supporting houses. A 30-ft. ipil pole costs $18 and is hard to get even at that price as the trees are very scarce. For this reason concrete poles are now being employed to a considerable extent in Manila. The most satisfactory concrete pole for that locality, as determined by tests, measures, 12 in. square at the bottom, 6 in. square at the top and 30 ft. long, and is made of a 1:2:3 mixture reinforced with four $\frac{5}{8}$-in. twisted rods. Poles of this construction cost $11.50 each and have given satisfaction.

Steel Mill to Use Central-Station Energy

A contract was recently signed by the Trumbull Public Service Company and the Western Reserve Steel Company, both of Warren, Ohio, by the terms of which the steel company is to be supplied with central-station energy for operating its entire equipment, the total rating of which will amount, in round numbers, to about 2000 hp. The installation will be started as a six-stand sheet mill and will be later increased to eight stands. It is, moreover, confidently expected that within two years the load will be doubled, and, in fact, such a contingency is provided for in the terms of the contract. Complete galvanizing, corrugating and metal-lath departments will be maintained, and at the start the company will employ between 500 and 600 men.

Several features of the electrical installation are unique. The main motor, connected to the roll train through a single herringbone reducing gear, will be a Westinghouse 1500-hp, 2200-volt, sixty-cycle machine operating at 210 r.p.m. In addition to this unit there will be about 200 hp in crane motors and 200 hp in miscellaneous motors of the three-phase, 220-volt type. It is estimated that the average demand will be 1000 kw and the yearly energy consumption 6,000,000 kw-hr., producing 2750 tons of sheet metal a month.

The main motor controller used will be of the Westinghouse liquid type. The motor when started with all resistance in its secondary winding will give full-load torque, taking about one and a quarter times full-load current. With the mill in operation the controller is so arranged that as the load exceeds a predetermined value the electrodes of the controller moving in their electrolyte will automatically increase the slippage of the motor, allowing the attached flywheel to carry both the load and the motor over the peaks.

Coincidently with the acceptance of this contract the Trumbull Public Service Company has practically rebuilt its station, taking out all of the old apparatus and installing two 4000-kw turbines of the new high-speed type recently brought out by the General Electric Company. These machines are among the first large units to operate at 3600 r.p.m. To insure uninterrupted service to the steel mill all feeders to the plant will be in duplicate.

The Western Reserve Steel Company is closely identified with the Thomas Steel Company, Niles, Ohio, and the Brier Hill Steel Company, Youngstown, Ohio, both of which have been strong adherents of the cross-compound steam engine as a prime mover, so that the competition between the steam and electric men on the job was keen. In closing the contract Mr. C. G. Thomas acted for the steel company and Messrs. W. J. Marshall and R. A. MacGregor acted for the Trumbull Public Service Company. Mr. C. G. Thomas is president of the Western Reserve Steel Company, Mr. F. W. Thomas is operating superintendent, and Mr. W. W. Lewis is secretary.

Determination of Wave-Length in Radiotelegraphy

The relation that should exist between the length of wave, size of antenna and current produced therein in order to obtain maximum transmission. By A. S. Blatterman

WHEN the size of aerial and available power are fixed the selection of wave-length has an important effect on the range of the station. It is well known that the radiation component of the aerial resistance is greater for short waves. Yet short waves suffer greater absorption than long ones, and the question therefore arises as to how we shall compromise in the selection of the proper wave-length so as to obtain considerable radiation and yet use a wave which is not highly absorbed. In short, what is the wave-length which will be most effective with the power and the antenna at hand?

Besides the variation with wave frequency in radiation and in absorption, another factor influencing the choice of wave-length is the similar change in the antenna current. The aerial current with a given potential maximum is greater for short waves. However, if attention is confined to the aerial current alone, without respect to potential, this can, with properly designed inductances, be made to be practically constant throughout a large range of wave-lengths. When the power in the condenser circuit is invariable the aerial current is affected only by the total equivalent resistance of the given aerial circuit. It is independent of an added self-inductance, altered wave-length or capacity, and the effect of the addition of any foreign element into the circuit, such as an inductance for the purpose of raising the wave-length, must be judged solely by its ohmic resistance.

The fourth influencing fact in the selection of wave-length is the distance over which transmission is to be effected. Both theory and practical experience point to the necessity of using long waves for long-distance transmission; but when comparatively short distances are to be covered on low power the use of a long wave presents no advantage whatsoever and, as has been shown, may even result in a weakening of received signals.

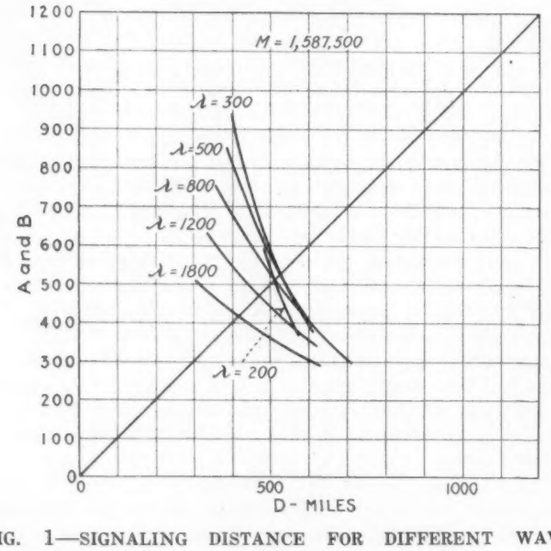


FIG. 1—SIGNALING DISTANCE FOR DIFFERENT WAVE-LENGTHS WITH FACTOR $M = 1{,}587{,}500$

It is proposed here to investigate the empirical equation worked out by Austin for daylight transmission over sea-water with a view of determining the best wave-length to use for transmission over a given distance for a given antenna and a given aerial current. Conversely, the curves hereinafter presented can be used to determine the range of a station when the wave-length, antenna height and current are known.

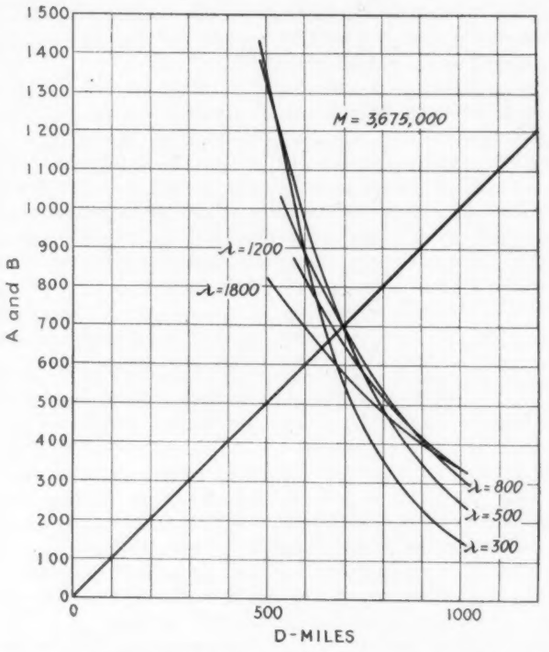


FIG. 2—SIGNALING DISTANCE FOR DIFFERENT WAVE-LENGTHS WITH FACTOR $M = 3{,}675.000$

An interesting paper[1] by Prof. A. H. Taylor has recently appeared in which experimental data are presented showing that a distinct optimum wave-length does exist. For the 1-kw station with which his experiments were made this wave-length was approximately 460 m and was the minimum at which the station could be efficiently operated. It is interesting to compare his practical results with those which could have been predicted by the use of a method such as that quoted in the present paper. Considering the fact that his experiments were carried out over dry prairie land the agreement seems very good. The equation stated[2] by Austin is:

$$I_r = KI_s \frac{h_1 h_2}{\lambda d} \varepsilon^{-ad/\sqrt{\lambda}}$$

where

I_r = current received through 25 ohms equivalent resistance (amp).

[1] "Optimum Wave-Length in Wireless Telegraphy," by A. H. Taylor, *Physical Review*, Vol. I, No. 4, April, 1913, pp. 321-325.

[2] Austin, L. W., *Bulletin* Bureau of Standards, 1911, Vol. VII, No. 3, pp. 315-363, "Some Quantitative Experiments in Long-Distance Radiotelegraphy."

I_s = sending aerial current (amp).
h_1 = height of sending aerial (kilometers).
h_2 = height of receiving aerial (kilometers).
λ = wave-length (kilometers).
d = distance between stations (kilometers).
α = an absorption coefficient.
= 0.0015 for transmission over sea-water.

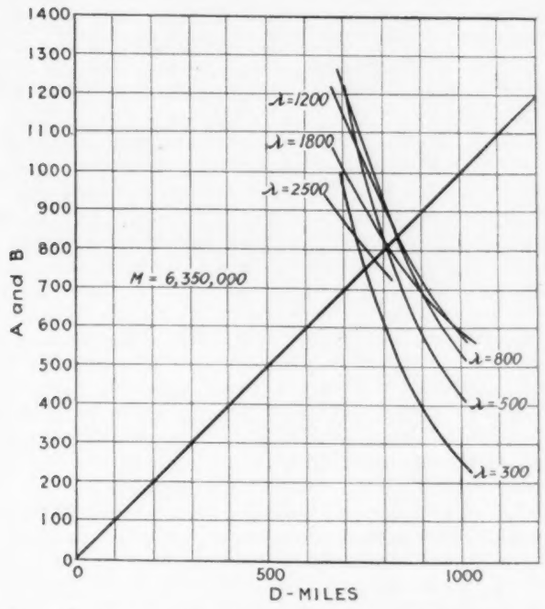


FIG. 3—SIGNALING DISTANCE FOR DIFFERENT WAVE-LENGTHS WITH FACTOR $M = 6{,}350{,}000$

The constant k has been determined by Austin to be 4.25 for the flat-top aerials on the cruisers used in his experiments.

As far as I am aware, there have not yet been collected and published any adequate data from which the values of α and k for overland transmission could be determined, though it is proposed to make experiments for this purpose at Washington University, St. Louis, Mo. As Taylor points out, it seems likely that transmission takes place according to the same general law of variation with distance over land as over sea.

The units of Austin's original expression are inconvenient for practical computations, and I am therefore giving the expression with its coefficients modified so that h_1 and h_2 may be measured in feet, d in miles, λ in meters, I_r in microamperes, and I_s in amperes. These are the units commonly used in this country in the measurements of the respective quantities.

$$I_r = \frac{635\, I_s h_1 h_2}{\lambda d}\ \varepsilon^{-0.0762 d/\sqrt{\lambda}}$$

An investigation of this equation shows, first, that there is a certain wave-length for a given value of antenna height and current, which will give maximum range in transmission. But, besides this, this best wave-length can be determined, and with it the concomitant values of antenna current and elevation for any given distance.

The first step is to solve the equation for distance; but, since this factor enters both as a coefficient and as an exponent, there is no explicit solution and graphics must be used[3] to evaluate d in terms of the other quantities.

[3] Hogan, J. L., Jr., *Elec. World*, June 21, 1913, pp. 1361-1366, "Quantitative Results of Recent Radiotelegraphic Tests Between Arlington, Va., and U. S. S. *Salem*," and *Proceedings*, Institute of Radio Engineers, July, 1913, pp. 75-102, "The Heterodyne Receiving System, and Notes on the Recent Arlington-Salem Tests."

The equation may be written:

$$d - \frac{M}{\lambda\varepsilon^{0.0762\, d/\sqrt{\lambda}}} = 0 \qquad (1)$$

where

$$M = \frac{635\, I_s h_1 h_2}{I_r}$$

and is evidently a parameter involving arbitrary constants.

The equation (1) is now of the form

$$A - B = 0$$

where

$$A = d$$

$$B = \frac{M}{\lambda\varepsilon^{0.0762\, d/\sqrt{\lambda}}}$$

The variables d and λ can now be assigned different values and A and B calculated. A and B thus determined can be plotted on the same scale as ordinates against d. The plot A to d gives a straight line (since $A = d$). The plot of B to d gives a series of curves having parameter λ which intersect the straight line graph of A to d. At the points of intersection of the straight line and the B curves

$$A = B,$$

and hence the distance d read off at this intersection is a solution of the general equation for any particular value of the parameter λ, as was shown by Hogan in the papers quoted.

The curves of Figs. 1, 2, 3, 4, 5 have been worked out in this way for different values of M. In calculating M it is necessary to know the value of receiving antenna current I_r. Austin has determined that this is about 10 microamperes for signals of just readable strength on ordinary apparatus and about 40 microamperes for fairly strong signals which can be read through moderate interference. It is likely that with modern apparatus these figures are conservative.

A glance at these curves of Figs. 1, 2, 3, 4, 5 shows that for each given value of M the solution for d increases with the wave-length up to a certain point; but beyond this point further increasing wave-length is accompanied by a decrease in distance.

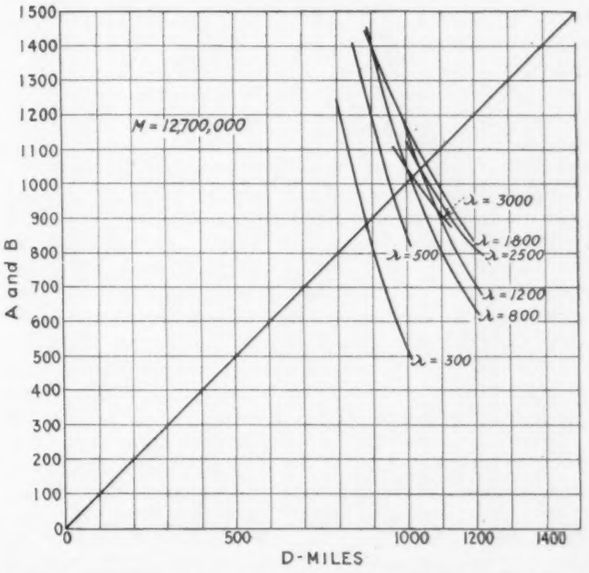


FIG. 4—SIGNALING DISTANCE FOR DIFFERENT WAVE-LENGTHS WITH FACTOR $M = 12{,}700{,}000$

If now the solutions for d at the different wave-lengths are read off and these values of d plotted against the wave-lengths to which they correspond a series of

curves are obtained having parameter M which exhibit distinct maxima of distance corresponding to a particular wave-length. See Fig. 6, which is drawn in this way.

For instance, if the value of M for a certain station is 3,675,000, which is true when $h_1 = h_2 = 100$ ft. and $I_s = 5.8$ amp for each 10 microamperes required in the

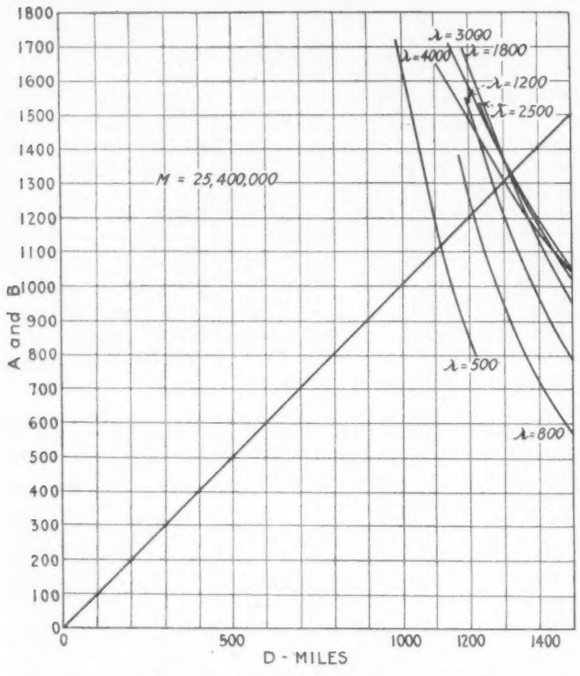


FIG. 5—SIGNALING DISTANCE FOR DIFFERENT WAVE-LENGTHS WITH FACTOR $M = 25{,}400{,}000$

receiving antenna, then Fig. 6 shows that the best wave-length to use is 700 m; and for the assigned signal strength at the receiving station corresponding to 10, 20 or 40 microamperes in the receiving aerial which was used in calculating M the maximum range is 700 miles.

It will be noticed that as M increases—that is, as higher power and higher aerials are used or the signal strength at the receiving station becomes less—in other words, as the distance increases, the wave-length which gives maximum transmission becomes less sharply defined. The curves become flatter and almost any wave for a considerable distance either side of the maximum will do almost as well as the optimum wave for maximum distance. A practical verification of this is found in some of the very long-distance tests which have been made in the past. Marconi has found that waves of 5000 m and 7000 m are about equally effective between his high-power transatlantic stations in Nova Scotia and Ireland, about 2000 miles apart.

The wave-lengths for which d is maximum at the different values of M in Fig. 6 can now be plotted against the respective values of M and the curve marked "wave-length" in Fig. 7 obtained. This curve shows the best value of wave-length to use for different values of M. Similarly, the maximum distances of Fig. 6, at different values of M, which can be obtained by the proper selection of wave-length can be plotted to M and the curve marked "distance" obtained, as in Fig. 7.

These curves of Fig. 7 can be used to determine the proper wave-length for transmission over any distance up to 1300 miles, and corresponding to this distance and wave-length the value of M required; or if M can be calculated from the dimensions of the sending and receiving aerials and the currents therein, the curves can be used to determine the greatest distance which can be covered with the assigned value of I_r, and simultaneously the wave-length which is proper to this distance and the power at hand. As an example of the first case, suppose that the maximum distance to be covered is 1000 miles. The "distance" curve (Fig. 7) shows that M must be 10.6×10^6. But the desired distance, 1000 miles, can only be covered with this value of M when the wave-length used is that read from the wave-length curve (Fig. 7) corresponding to this M ($= 10.6 \times 10^6$), namely, $\lambda = 1550$ m. A wave very much shorter or very much longer than this will reduce the range.

For any value of M a choice of antenna height and received signal strength immediately fixes the sending aerial current I_s, and this is a direct index of the power to be used in the sending station. If the antenna chosen is low, then a high value of I_s is necessary, whereas a smaller value of antenna current will have the same range if produced in a higher aerial. In other words, for the same range of transmission there are two alternatives, either higher tower and lower power, or higher power and lower tower. The choice lies between the initial outlay and running expenses, although for safer and handier operations, and freedom from occasional break-down of apparatus, smaller power with higher tower would be preferable. The question is one of economy according to actual circumstances.

Figs. 6 and 7 show a peculiar fact of practical importance. This is that the wave-length giving extreme range does not necessarily produce the strongest signals at shorter distances. At distances below the maximum, at which signals are just audible, the minimum value of M, and hence the greatest I_r, occurs at a shorter wave-length than that used for the maximum distance. This has been at least partially verified by Professor Taylor and reported by him in the above-mentioned paper.*

For a given pair of fixed stations the factor M is

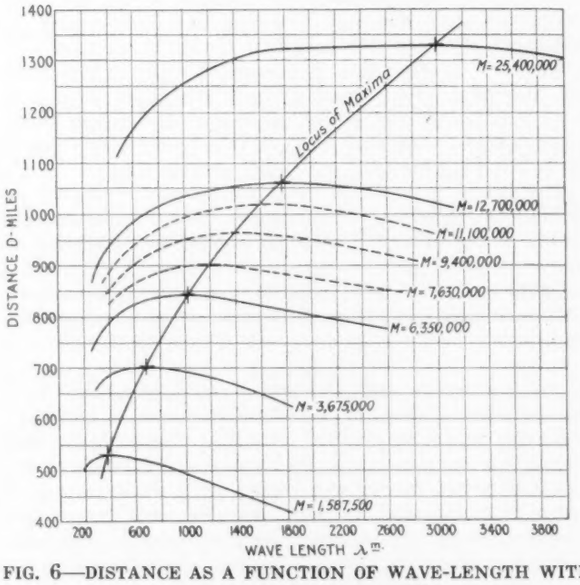


FIG. 6—DISTANCE AS A FUNCTION OF WAVE-LENGTH WITH DIFFERENT VALUES OF M

constant, for h_1 and h_2 are invariable and a change in the current in the sending aerial produces a proportional change in that at the receiver. The wave-length which will allow communication with the least power is read from Fig. 7 and the sending aerial current required is calculated from the corresponding

* A. H. Taylor, *loc. cit.*

value of M by assigning to I_r the value 10 microamperes, which is Austin's figure for bare audibility of signal, or a larger value if louder signals are needed.

As an example, we may work out the extreme range and proper wave-length for a station with 12 amp aerial current, which corresponds to a moderately efficient 2-kw set, and flat-top antenna 100 ft. high, sending to a similar receiving station.

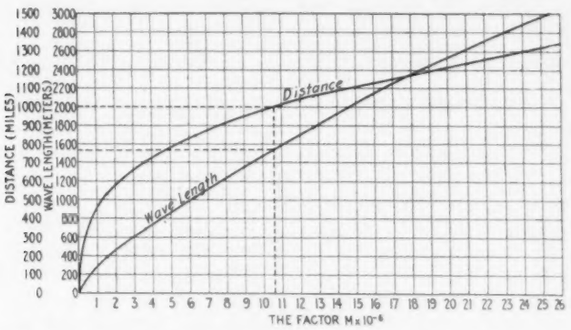


FIG. 7—PROPER WAVE-LENGTH TO USE AND VALUE OF FACTOR M FOR TRANSMISSION OVER A GIVEN DISTANCE

$$M = \frac{635 \times 12 \times 100 \times 100}{10} = 7.63 \times 10^6.$$

Referring to Fig. 7, the best wave-length for this station and the maximum distance which can be reached in daylight over sea-water when this wave is used are respectively 1200 m and 900 miles. However, any wave between 800 m and 1600 m would seem to give almost as good results (Fig. 6), and this fact might be used to advantage when it is desired to avoid interference without appreciably reducing the range of the station.

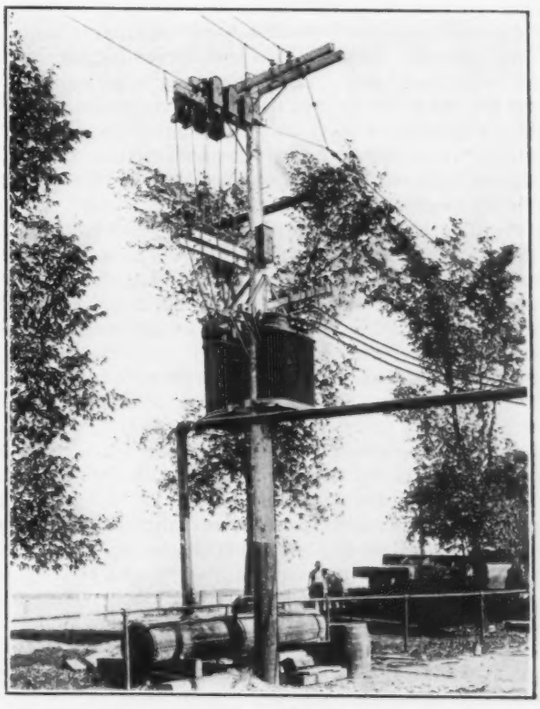
The dotted curves of Fig. 6 have been exterpolated by drawing the curve marked "locus of maxima" and the use of Fig. 7. The blanks for other values of M can be filled in in a similar way, and these curves will then show the effect on range of changing from the theoretically best wave-length given in Fig. 7.

In conclusion, the graphical method of solving the Austin-Cohen equation, and particularly the curves of Fig. 6, show the great advantage of long waves for transmission over great distances, and at the same time the great disadvantage of long waves when only comparatively short distances are involved. These results are borne out qualitatively in practical experience, and they also agree with the rational equations of Sommerfeld[5] and others which show that long waves must be used to cover great distances. The most important conclusion, however, is that though the optimum wave-length for a station does not appear to be a very accurately determinable quantity, yet for a given aerial and given power there *is* a certain wave-length which will give maximum transmission, and hence in designing and adjusting a transmitter it may be of importance properly to correlate the wave-length with the size of the antenna and the current produced therein.

Electrical Construction of Water-Intake Tunnel

Replacing all of the steam-driven machinery used in constructing the new Linwood Avenue reinforced-concrete water intake in Milwaukee by electrically operated machinery is an interesting example of the "survival of the fittest." This tunnel will supplement one already in operation at McKinley Park. It will be 12 ft. in diameter and 4000 ft. long when completed and will receive its water supply from Lake Michigan in the vicinity of Lake Park. The contract for constructing the intake was awarded to Joseph Hanreddy, contractor, Chicago. When the work was started it was intended that steam-driven machinery would be used. Since then several machines have been discarded until now all that remains to give evidence of steam motive power is a scrap heap on top of the hill near the scene of the work where steam-driven air compressors, fans, hoists, etc., are piled in readiness to be carried away to some job where electricity is not known. In their place the construction company has erected a substation which receives energy from the Milwaukee Electric Railway & Light Company and distributes it to different parts of the grounds where machinery has to be driven.

Electricity is delivered to the substation over a 2300-volt transmission line coming from the north, which receives its energy from two different lines owned by the Milwaukee Electric Railway & Light Company, thus reducing the possibility of interruption to service. The substation terminal of this line is shown herewith. The pole at which this line terminates also supports two outdoor-type three-phase, 2300/220-volt transformers having ratings of 60 kw and 75 kw respectively. These are arranged symmetrically on each side of the pole, and are connected in multiple on both the high-tension and low-tension sides. The transmission line supplying them with energy consists of three No. 2 copper conductors. Service drops from these lines pass through Matthews fuse switches and through a Wright demand meter installed on the pole and connect with the high-tension terminals of the transformers. The secondary leads of the transformers are tied together,



TRANSFORMERS SUPPLYING ENERGY FOR CONSTRUCTION OF WATER-INTAKE TUNNEL

and three 500,000-circ. mil cables connect them with the switchboard buses inside the substation. The neatness of appearance and the comparative safety with which linemen can work on this pole are noteworthy features.

The substation is a temporary affair, being built of wood, and contains a small electrically driven machine

[5] Sommerfeld, *Ann. d. Phys.*, Vol. XXVIII, 1909.

shop and a 150-hp motor-driven Ingersoll-Rand air compressor which supplies high-pressure air for operating the drills used in tunneling. The motors installed are three-phase wound-rotor induction motors and are controlled by General Electric starting panels having six contactors. The 150-hp motor drives its compressor by means of a belt and is automatically started and stopped by a pressure-regulating device installed on the starting panel. The pressure tank into which the compressor delivers its air is placed outside the plant beneath the pole shown. In addition to the starting panels there is a main distributing switchboard in the substation, which was manufactured by the Koschin Company of Milwaukee. On it are mounted the main service switch, a wattmeter, and eleven three-blade knife switches, three of which control the air-compressor motors, while the remainder control an electric pump, a concrete mixer, a motor-driven hoist, and the lamp circuits and small motor equipment.

Four three-phase circuits delivering energy to apparatus in the tunnel and along the lake shore are supplied with energy from the main switchboard. Inside the substation they are supported on insulators fastened to cross-arms hung from the ceiling. The wires pass through the east wall of the building, and from that point they are carried on wooden poles down the bank which skirts the lake shore to the apparatus which is operated by electricity in the head-house over the shaft and in the tunnel.

An electric hoist for raising excavated material from the water intake tunnel is installed near the mouth of the shaft leading to the tunnel. The hoist was manufactured by the Lambert Hoist Company, of Newark, N. J., and was designed for operating on steam power, but it was remodeled on the job and connected to a 37.5-hp General Electric wound-rotor induction motor. While a concrete head-house was being constructed over the shaft the hoisting had to be done by a steam engine installed on a high bank above the shaft opening. The hoisting cable extended from the cable drum on the top of the bank down to a pulley at the base of a stiff-leg on the lake shore, thence along the boom and over another pulley and down into the shaft. The simplicity of the electric hoist as compared with this arrangement can only be appreciated by one who has actually witnessed the conditions under which work had to be performed. All hauling in the tunnels was done by mules.

As construction material such as crushed rock, cement, steel forms, etc., has to be unloaded on top of the bank about 60 ft. above the level of the lake, some means had to be provided for conveying this material down to the place where it was needed. All of the material had to be lowered and practically none had to be raised, so that the method of lowering did not require any large power unit. An inclined double track was constructed up the slope of the bank, and an air-driven engine was installed at the top to convey the cars carrying the material from the place where they are loaded to the top of the incline, from which they descend of their own weight, the engine acting only as a brake to prevent too rapid acceleration when descending.

At the bottom of the incline is a motor-driven concrete mixer, into which the crushed rock and cement can be dumped from the inclined railway cars. This mixer is operated by an induction motor rated at 15 hp, the starting compensator and fuses being installed in a weatherproof box above the concrete mixer. The inclined track is illuminated by a string of incandescent lamps controlled and fed from a circuit at the top of the incline.

For clearing the drills when they are in operation water under pressure has to be supplied. This is furnished by a Jeanesville horizontal double-suction volute pump directly connected to a 35-hp motor running at 1800 r.p.m. The pump is capable of delivering 750 gal. per minute. A reserve supply of water is furnished by a Cameron duplex pump operating on air.

When blasting it is necessary to remove smoke from the tunnel to prevent the fouling of air. A motor-driven Garden City fan has been installed for this purpose. The motor is rated at 15 hp and operates at 1200 r.p.m.

The tunnel is lighted by electricity, and as the tunnel is extended more lamps are added. Instead of putting in booster feeders which would maintain a constant voltage throughout the length of the tunnel, the company employed lamps of different voltage ratings.

Using electricity exclusively for construction operations on a job of this kind where interruption to service might mean fouling of air in the tunnels is a tribute to the central-station company supplying the energy. Construction operations have been carried on night and day, and it is asserted that the automatic starting panels used on the compressor motors will pay for themselves in six months by eliminating the services of an engineer.

An Extensive Transmission System in Michigan

In general the hydroelectric plants of Michigan serve limited areas, but the Commonwealth Power Company is a notable exception. It owns sixteen water-power plants, of which fifteen, aggregating 68,000 hp, together with numerous steam-operated stations, are tied together by the transmission lines of the Au Sable Electric Company. The highest rating of any station on the system is 15,000 hp, the average head of those stations submitting statistics being 25 ft. The maximum head employed is 45 ft. and the lowest head is 12 ft. The accompanying map indicates the extent of

TRANSMISSION SYSTEM OF AU SABLE ELECTRIC COMPANY, JACKSON, MICH

this transmission system, showing the towns and cities served thereby as well as the transmission-line voltages. The 140,000-volt line from Au Sable to Flint and Owosso was described and illustrated in the *Electrical World* of April 13, 1912.

Central Station Management

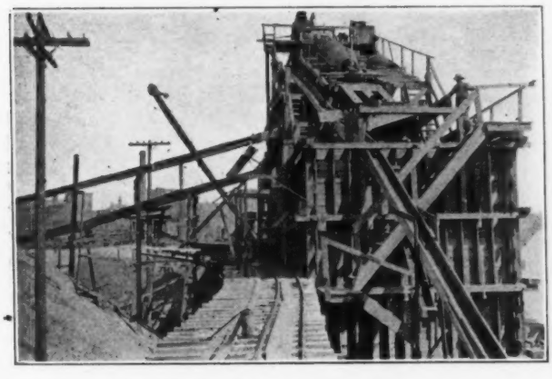
Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

Aftermath of a Flatiron Sale

On June 9 the appliance-sales department of the Union Electric Light & Power Company, St. Louis, Mo., under the direction of Mr. C. E. Michel, disposed of 2402 standard 6-lb. household irons at a reduced price —$2.85— (*Electrical World*, June 27, 1914). Naturally it might have been expected that the iron sales for the remainder of the month of June would fall off considerably, but the fact was that 309 irons were sold during the remainder of that month at the regular price—$3.50 —making a total of 2711 irons sold in June.

Electrical Gravel Washing on the Illinois River

With its 100 hp in motors, a sand and gravel company operating just across the Illinois River from Peoria, Ill., furnishes a profitable load for the Central Illinois Light Company of that city. Barges, each capable of holding from 100 tons to 150 tons of rocks and gravel, are towed up the river 16 miles to the company's 40-acre pit, filled by a steam dredge boat, and then towed down stream again to the washery, each barge making a round trip to the pit once a week. At



MOTOR-DRIVEN GRAVEL WASHER

the washing plant the gravel is unloaded into a hopper by means of a crane and grab-bucket operated by a steam hoisting engine. A 75-hp motor belted to a bucket conveyor, crusher and set of pumps then lifts the gravel to the top of the washery, where it is screened, the large gravel and rock being conducted through a crusher and the finer material going to the washer. Inclined rotating screens of conical shape, which are driven by a 25-hp motor, sort the gravel according to size while streams of water played into the screens remove the dirt and sand. From the screens the washed gravel travels by gravity directly to the storage bins. Chutes extending over a spur railroad track allow the gravel to run from the bins to the cars beneath. A view of the 100-kw, 2200/220-volt transformer installation, the revolving screens and the 25-hp motor housing at the top of the washery is shown in the illustration herewith.

Civil-Service Methods in Selecting Motor Salesman

At present considerable attention is being given by the new-business department of the Toledo (Ohio) Railways & Light Company to securing motor customers on existing lines, and when Mr. R. A. MacGregor, who is conducting the motor-service campaign, wanted a man to handle small-motor work he decided to pick one from the company's lighting solicitors. The selection was made on a competitive basis by giving the lighting solicitors, at their own option, an examination covering the work they had been doing. Practically the entire force elected to take the examination, and after answering the questions put they were so well pleased with the manner in which new points of information were brought out that they have petitioned for similar tests to be held at regular intervals.

The Human-Interest Note in Central-Station Advertising

Operating a number of electric-service properties throughout the Middle West from Ohio to Oklahoma, the Light & Development Company, of St. Louis (Mo.), found itself face to face with a difficult problem of public policy as soon as it contemplated circularizing its distant customers with letters under the home-office letterhead. The average man does not like to think that the electric-light company to which he pays his monthly bill is owned by capitalists in a distant city, so to obviate this antagonistic feeling and to bring about a closer understanding between his company and its customers Mr. William A. Smith, vice-president of the company, in charge of new-business affairs, originated a series of circular letters written according to the following plan: The name "Bill Smith" in script was used as the heading for all the letters, first, because it is "about the commonest name in the world," and, second, because the letters were really written by "Bill Smith" to the companies' electric-service customers. And just there doubtless lay the real secret of the success of the entire series, for each part of every letter, from its heading to its signature, related a fact or true incident.

The first paragraph usually described some happening in the life of the real William Smith as he grew from boyhood to the estate of middle age. The second paragraph gave his honest recommendation of electric appliances which had been tried in his home and found successful. And not only did such recommended appliances first have to prove themselves successful, but it had to be demonstrated that each device to be mentioned in the letters was something which the average family uses often. For, said Mr. Smith, it is unwise to induce persons to invest money in electric devices that they seldom if ever use.

To illustrate the interesting manner in which the letter series was worked out, a copy of the first, minus the name of the prospective-appliance customer and the date, is reproduced herewith. The second letter began as follows:

"Did you ever read 'The Harvester'? It is a beautiful

story, strong, pure and sweet. It brings you in touch with Mother Nature, taking you close to her heart of hearts. To the tired desk worker it brings a breath of out-of-doors. Get it and read it. You will then thank Bill Smith for the suggestion."

The second paragraph of this letter suggested the advantages of an electric vacuum cleaner and ended significantly, "Mrs. Bill Smith has one and would not be without it," signed, "Your friend, Bill Smith."

Flower Seeds—Stealing the Congressman's Thunder

One week later, when thoughts of spring were in the minds of Bill Smith's readers, he wrote them a letter saying: "Recently, while visiting for the first time one of our Southern towns, I asked an old darky to direct me. The information was readily given, and I had crossed the street when the darky called, 'Say, boss, don't yer reckon spring's on t'other side of der fence?' I replied that I thought it was. 'Well, boss, I sure's glad, 'cause I's tired ob winter.'

"Spring is here. The robins have come. The bluebirds are again twittering their love song from the apple tree. 'Tis the time to plant that we may later reap. I therefore inclose a little package containing flower seeds. Plant in a two-foot space and watch them grow, or give the commission to some of your little friends, telling them that Bill Smith would like to know what success they have."

The second paragraph recommended the purchase of an electric stove and told how Mrs. Bill Smith, seated at the breakfast table, had broiled the spring's first mess of mushrooms and served them on delicious "electric" toast.

Returns from this letter were gratifying, for not only were many electric stoves sold but the flower seeds sent out with the letters grew. And later in the month Bill Smith began receiving scrawly letters in childish script telling of flower gardens that bloomed in many a little city in the Middle West. Most of these were answered in a kindly spirit that made the parents fast friends of the Light & Development Company.

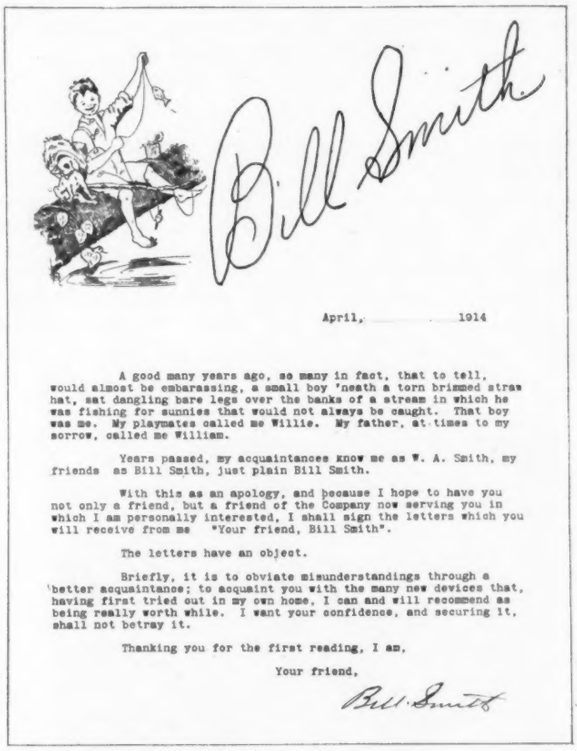
Later, under the date of May 28, when the season was right, Bill Smith took occasion to discredit the popular belief that "puffballs" are poison. He said: "As a small boy I often brought my bare foot down on a little ball, found in the meadow, to see the cloud of brown dust that it sent up. 'Devil's snuffboxes' we called them. Last fall, on a trip back to the old farm to see the dear father and mother, still fond of their firstborn, I wandered over the meadow and gathered a number of the same puffballs, just up from the rich soil, took them home, peeled them as you would a potato, sliced the firm, white interior and fried them in butter. Father said 'poison,' but, as I survived, he, as well as the mother and others, ate and enjoyed the next lot. Puffballs just up, peeled, sliced and fried in butter, are delicious. No danger in puffballs, even for the novice. Try them and you will thank Bill Smith for many nice messes of mushrooms."

Following this bit of advice came the thoughtful hint that the warm spring and summer days might be rendered entirely comfortable by the use of an electric fan—"a device which in operation is so inexpensive that it may be allowed to run all night to bring restful sleep to the tired worker."

"Much Fire No Good, Heap Burn, No Cook"

Vacation is the thought uppermost in many minds when the middle of June arrives each year. Under the date of June 12 Bill Smith wrote: "It was my good fortune to spend several weeks in the wilds of Canada, having as a guide a Canadian Indian. The delight of the day was the noonday meal, consisting of coffee, flapjacks, boiled potatoes, and fish. The Indian was an expert camp cook, and it was ever a marvel to me how he could cook so much on so little fire, which was usually made with a few twigs and a handful of sticks. His explanation was, 'Much fire no good, heap burn, no cook.' The secret was in the knowing how. How much needless worry, work and trouble the knowing how saves us! How much labor, sorrow and regret the not knowing causes! On your vacation trips build small fires and always put them out when the need for them is over.

"To be absolutely consistent in my letters to you, to find out the real value before giving you my opinion, I purchased and had installed in my home an electric range, taking out and disposing of the gas stove. We are now depending on it entirely for our meals, and it is a real delight. Takes a little more time to start things boiling, possibly four or five minutes, but the regulation is perfect. The steaks and meats broiled or


Bill Smith
April, 1914
A good many years ago, so many in fact, that to tell, would almost be embarassing, a small boy 'neath a torn brimmed straw hat, sat dangling bare legs over the banks of a stream in which he was fishing for sunnies that would not always be caught. That boy was me. My playmates called me Willie. My father, at times to my sorrow, called me William.
Years passed, my acquaintances know me as W. A. Smith, my friends as Bill Smith, just plain Bill Smith.
With this as an apology, and because I hope to have you not only a friend, but a friend of the Company now serving you in which I am personally interested, I shall sign the letters which you will receive from me "Your friend, Bill Smith".
The letters have an object.
Briefly, it is to obviate misunderstandings through a better acquaintance; to acquaint you with the many new devices that, having first tried out in my own home, I can and will recommend as being really worth while. I want your confidence, and securing it, shall not betray it.
Thanking you for the first reading, I am,
Your friend,
Bill Smith

LETTER NO. 1 OF THE "BILL SMITH" SERIES

cooked in the oven are delicious, and for baking cakes, bread, pastry or making biscuits the oven simply cannot be beat. I have to pay for energy used for cooking 6 cents per kw-hr., and it will cost me about one-third more than gas. As you have a 4-cent rate it will cost you only two-thirds as much as it does me. The kitchen is cool, no smoke, grime or dirt. It is the ideal way and cheap at twice the price. Have the electric company install one on trial. Use it and you will say, like the Indian, 'Heap fire no good, little fire great.' I recommend the Hughes electric range. Won't you take my word and try it?"

But in point of human interest the letter of June 20 probably capped the climax, when Bill Smith allowed himself to write a couple of verses signed, "Your little friend, Bill Smith, Jr., per Daddy," for just a few days before a new baby had come to the home of Mr. and Mrs. Smith and, as stated in the letter, "it weighed 9.25 lb. and caused a happy father to tread on air."

With the consistency that marked all the other letters, this missive was concluded with a short paragraph recommending a washing machine which "would do the entire family wash (including the baby's) with very little work."

For those who would like to know the dollars-and-cents value of this type of advertising it may be said that during the first five months of 1914 the company has been able to do $70,000 worth of appliance business, and it is confidently expected that the total sales for the year will aggregate from $225,000 to $250,000. It goes without saying that the load on the various plants belonging to the company has increased by a corresponding amount.

Economical Shoe-Repairing Methods

Operating a Fleming No. 9 shoe-repairing machine driven by a 3-hp, 220-volt, single-phase, sixty-cycle motor running at 1800 r.p.m., an electric-service customer of the Central Illinois Public Service Company has learned that proper operation of the outfit saves considerable money. This customer's bills over a period of one year vary from 15 kw-hr. to 46 kw-hr., and he says that although trade varies somewhat with the seasons, this difference is in main part due to the different methods of various workmen, some of whom use three times as much energy as others in doing a specified amount of work. Two-thirds of each month's energy bill can be saved, according to this customer's statement, if all shoes are first made ready for the machine and then put through the machining processes as rapidly as good workmanship will permit.

District Heating in Toledo

When the Toledo Railways & Light Company was formed by the consolidation of the railway, gas and electric-lighting plants in the city and vicinity, a district heating equipment was necessarily included as it formed an important element of the electric-lighting plant. It should be understood, therefore, that the Railways & Light Company did not put this plant in as an off-peak-load proposition or as a means of increasing the thermodynamic efficiency of its power stations. It was inherited, so to speak, and while the inheritance may not have been particularly welcome, it was considered to have money-making possibilities. The present company has developed and extended the heating system and has endeavored to put it upon a paying basis. The details of the service have had careful study and the users are satisfied with the results. There is, in fact, a demand for more service than the company is at present prepared to furnish and plans for extension are being considered.

Heating service is given by means of both steam and hot water, about 80,000 sq. ft. of radiation being supplied by the former and 1,000,000 sq. ft. by the latter. The principal source of heat is the exhaust steam from three power plants, the largest of which is the Detroit Avenue station. This contains three Westinghouse steam turbines, two of 1000 kw and one of 3000 kw. Of these the smaller ones only are connected with the heating system, but the large one will probably be so connected eventually. The steam is exhausted into closed heaters at 5 lb. per sq. in. back pressure, in zero weather reducing the electrical output of the generators to somewhat more than 80 per cent of their rated capacity. The heaters are similar to surface condensers except that the steam is condensed on the inside of the tubes. The turbines are supplied with steam by batteries of two 300-hp Stirling boilers with Jones underfeed stokers, five 400-hp Stirling boilers with Murphy furnaces and extended "Dutch ovens" and two 650-hp Stirling boilers with Jones stokers. In addition there is a 200-hp boiler used for direct heating of the water or for supplying live steam for steam heating. This station contains two centrifugal circulating pumps driven by 135-hp Terry turbines.

The smaller plants are primarily for heating, their electrical output being a by-product. These are situated in the center of the heating district on Floyd Street and Twenty-second Street respectively. Each contains a 600-hp Corliss engine direct-connected to a 425-kw, 550-volt direct-current generator. All exhaust steam from engines and auxiliaries is utilized in the heating system.

There are at present more than 1400 buildings connected with the stations, requiring 60 miles of single pipe for supply and return. The pipe ranges in diameter from 12 in. down to 1½ in. The pipes are laid in triple wooden boxes of 1-in. plank with ½-in. air spaces between boxes. The lumber is treated with crude oil, and the shavings which are packed around the pipes are similarly treated. The water is maintained under a pressure of 50 lb. to 70 lb. per sq. in., and from 20 deg. to 30 deg. Fahr. difference between the temperatures of incoming and outgoing water is maintained. The temperature of the outgoing water is varied to suit atmospheric conditions, its value in zero weather being 208 deg. In warmer weather it may be as low as 80 deg. One million gallons of water is required to fill the system. This water is circulated at approximately ½ gal. per hour per square foot of radiation. The leakage at present is practically negligible, amounting to but one-sixth of 1 per cent of the water circulated. A small steam pump drawing water from an artesian well supplies the make-up water.

In combined power and heating plants of the nature of those described it is difficult to determine an equitable division of costs between the two branches of the service. In the present case the heating service is credited with ¾ cent per kw-hr. for alternating-current energy turned out and 1 cent for direct-current energy. Heat is sold on a flat-rate basis for the heating season, and the demand is calculated from an empirical formula which gives satisfactory results. This is

$$R = d\left[75\left(\frac{W-G}{h}+G\right)+C\right]$$

Where R = equivalent square feet of radiation,
d = temperature constant, from table,
W = exposed wall area in square feet,
h = wall constant, from table.

Tables of these constants are given in Carpenter's "Heating and Ventilating" and other standard works. The value of d for a 70-deg. room temperature is 0.0082 and that of h for average walls is 5.

The net rates per square foot determined from the above formula are: Not over 500 sq. ft., 18 cents per square foot; 500 sq. ft. to 2000 sq. ft., 17 cents; 2000 sq. ft. to 5000 sq. ft., 16 cents; over 5000 sq. ft., 15 cents. On this basis heating costs consumers somewhat more than coal, but when the additional cost of attendance is considered the excess is not serious. It is easily offset by the convenience and uniformity of the heat from the central station. Mr. A. G. Rogers, superintendent of heating, seems to have no great difficulty in convincing prospective customers of this fact. He is enthusiastic over the operation of a district heating plant in conjunction with lighting and power plants.

Illumination and Wiring

Alternating-Current Distribution at Rotary-Converter Voltage

An installation recently completed at Nankin, Ohio, a village of about 200 inhabitants, employs a distributing potential of but 365 volts. Lighting of the town is to be furnished from the lines of the Cleveland Southwestern & Columbus Railway Company, and in order to save the expense of extra high-voltage transformers the electrical energy has been used as it is taken from the traction-line transformers for the rotary converters at 365 volts and a frequency of twenty-five cycles. Secondary circuits operate at the standard potential of 110 volts.

Mr. Thomas R. Woulfe, manager of the light and power department of the railway company, says that of the fifty houses and stores in the village forty-eight have been wired for electric service. Twenty-four-hour service is being rendered, and the maximum rate is 10 cents per kw-hr., with a minimum charge of $1.

High-Efficiency Illumination of Municipal Swimming Pool

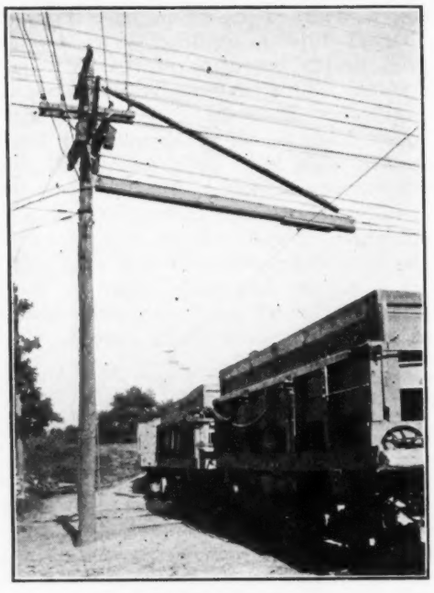
Fairgrounds Park in northwest St. Louis is the site of the city's 4,000,000-gal. swimming pool, wherein the owner of a bathing suit may play in the water free of charge while others must pay one cent for the rental of a bathing suit and another cent for a towel. Of circular shape, the huge concrete bowl has been so divided that the swimming pool proper, which is 12 ft. deep at the center, occupies a segment of the circle measuring approximately 560 ft. by 310 ft., while the remainder comprises a shallow wading pool for children.

To supply adequate and efficient illumination for night bathing in the pool was one of the problems confronting the city's engineers, Messrs. A. I. Jacobs and Ralph Toensfeldt. At first flame-arc lamps were tried, but when illumination measurements were made over the surface of the pool it became apparent that the difficulties of seeing, of which the life guards had complained, were quite real. Directly beneath the lamps the illumination was intense, but between lamps there were dark spots, rendered less evident perhaps by the glare of the lamps themselves on the water.

With the recent rehabilitation of the lighting system, ten high-efficiency 1000-watt tungsten lamps and two mercury-vapor lamps were installed, producing results which are much more satisfactory. The large tungsten lamps, in General Electric closed outdoor fixtures, are placed on steel poles spaced about 100 ft. apart and set about 40 ft. from the edge of the pool. The lamps hang 31 ft. above the water. At the center of the pool two Cooper Hewitt mercury-vapor lamps are mounted on a single standard and hang 27.5 ft. above the water. Although this new installation effects a saving in both first cost and expense of operation, it is said that guards are now easily able to see swimmers in any part of the pool.

Joint Pole-Line Construction

It has been aptly said that the engineer is a man who can do more for $1 than the average man could do for $2, but it is often the economical line foreman who will be found working his tools and materials to the limit of their usefulness. An example of what is sometimes



POLE DOING HEAVY DUTY

accomplished along this line is afforded by the accompanying illustration. Here is shown a 25-ft. pole which is not only doing triple duty as a telephone-cable pole, a lighting-circuit pole and a trolley-wire support, but is doing it in an unusual manner. For the messenger wire supporting the telephone cable has been

LIGHTING OF MUNICIPAL SWIMMING POOL, ST. LOUIS, MO.

called upon to play an important part in the trolley-bracket construction. Where a less thrifty man might have used an iron trolley bracket, the crafty line foreman has utilized the wooden insulation about the telephone cable which would have been necessary in any event, on account of the proximity of the trolley wire.

The Illumination of Small Show Windows

BY H. B. WHEELER AND J. A. HOEVELER

Although the owners of large stores have paid much attention to proper and economic illumination of their show windows, and this fact has resulted in the development of highly efficient window-lighting equipment for large windows, the small store owner has been more or less content to illuminate his windows in a haphazard, and in many cases most inefficient, manner. There is no adequate reason why the small store owner should not obtain the maximum of results from his window lighting. In fact, he should be more keen to eliminate all possible waste than his big competitor, who may depend for business to a large extent on his very "bigness."

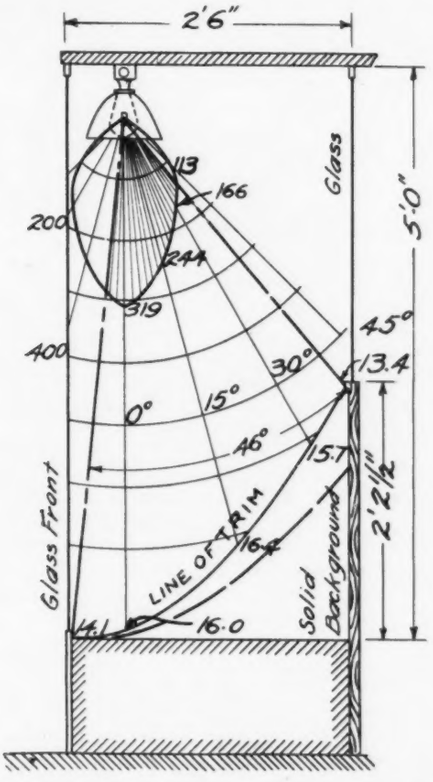


FIG. 1—SYMMETRICAL SILVERED MIRROR REFLECTOR INSTALLED IN A TYPICAL SMALL SHOW WINDOW

A type of window that is typical of the small jewelry store, cigar store and shoe store is shown in cross-section in Fig. 1. The average dimensions of these windows are as indicated. The line of trim in the case of the shoe store is approximately as shown by the heavy black line, whereas for jewelry stores and cigar stores it is usually somewhat lower and more flat, as indicated by the heavy broken line. The solid background usually extends up slightly less than half way from the floor to the ceiling.

In order that sufficient light may be directed to the front faces of the vertical objects, the lighting units must be placed near the front of the window, and in order that the lamps may be as nearly concealed as possible, they should be placed at the ceiling. A very common type of equipment which is used in windows of this character is a symmetrical reflector of the concentrating type. A one-piece silvered-mirror reflector having these characteristics is shown in Fig. 1. It gives the light distribution shown when used with the 60-watt lamp.

The angle intercepted by the line of trim in the plane perpendicular to the glass front is approximately 46 deg., whereas the reflector distributes the light flux over an angle of 110 deg. Thus, quite a large percentage of the light flux is lost through the glass front and may be considered wasted in so far as the lighting of the window is concerned. A slightly greater percentage might be confined to the window by tilting the reflector at a slight angle, but this would expose the lamps to view from within the store, which, of course, is objectionable.

By employing a reflector with a specularly reflecting

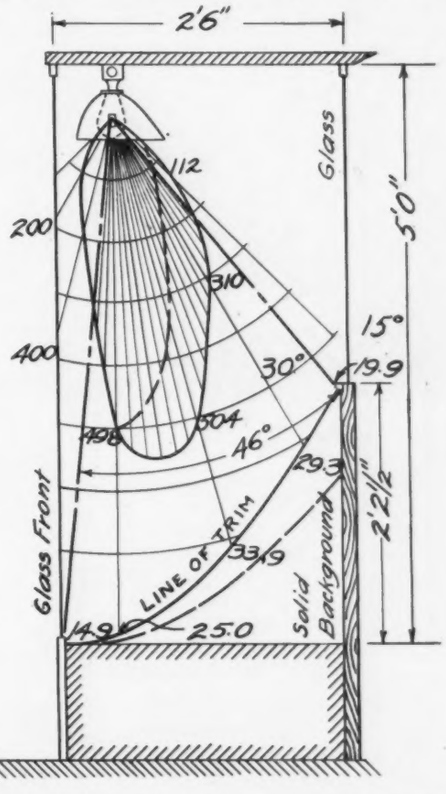


FIG. 2—NON-SYMMETRICAL SILVERED MIRROR REFLECTOR INSTALLED IN A TYPICAL SMALL SHOW WINDOW

surface, which permits the greatest degree of light control and concentration, similar to the silvered-mirror surface of the reflector of Fig. 1, and designing it with a non-symmetrical contour like that shown in Fig. 2, a large percentage of the wasted light flux may be confined within the window. This reflector (Fig. 2) is designed for use with the 60-watt tungsten lamp. The light distribution in the plane perpendicular to the glass front is asymmetrical, as indicated by the heavy black curve, whereas in the plane parallel to the glass front it is symmetrical, as indicated by the heavy broken-line half-curve. The light flux is nearly confined within the 46-deg. angle, giving the high candle-power values indicated. The normal illumination values in foot-candles as calculated for the various points along the line of trim are shown in Figs. 1 and 2 for a single unit. A comparison of these values will indicate the effective man-

ner in which the reflector of Fig. 2 concentrates the light flux along the line of trim.

The percentage of the total light flux of the lamp concentrated on the surface along the line of trim in the case of the symmetrical reflector of Fig. 1 has been found to be 29.7. It is estimated that the non-symmetrical reflector of Fig. 2 will deliver approximately 40 per cent on this surface, which in round numbers means that this reflector will deliver one-third more light flux onto the trim for the same power consumption.

Large Motion Sign in New York

Erected over a building on Broadway near Forty-ninth Street, New York, is a large electric sign containing 1750 10-watt lamps which is kept lighted until 2

FIG. 1—BROADWAY'S LATEST-RUNNING SIGN

a. m., probably later than any other sign in that city. The operation of the sign is as follows: The circle around the letter "P" lights, whirling as it does so, and is followed by the illumination of each of the remaining circles, which rotate in succession, giving the

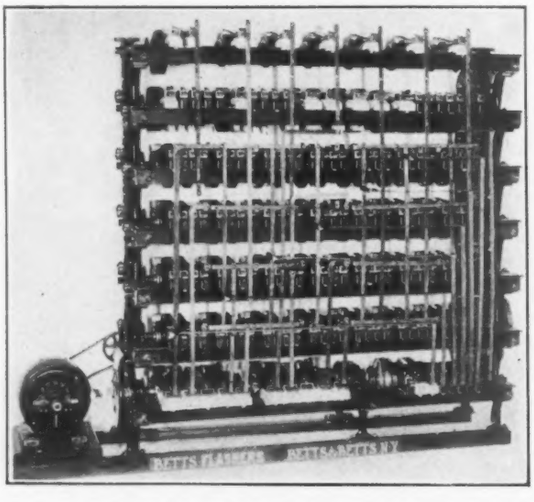


FIG. 2—LARGE FLASHER MECHANISM EMPLOYED WITH MOTION SIGN

appearance of a hoop rolling from left to right across the sign. All lamps are then extinguished and the hoop appears to roll backward. Following this effect each circle is illuminated one after the other until all are on, when they are again extinguished. All hoops then flash on together and are extinguished.

The next effect is to light each circle with its inclosed letter, the circle meanwhile rotating. The border legend then lights up, one word at a time, until all are on, after which the border decoration lights up for a short time. The building up of these effects requires eleven seconds. The entire sign is lighted in forty-three seconds and is dark six seconds, one minute being required for a complete cycle.

The sign is 48 ft. high, 72 ft. wide, weighs approximately 11 tons and contains 4500 ft. of open-wire construction. The letters of the main text are inclosed in a black border to contrast against the open sky on a bright day. The letter "P" is 15 ft. high and the inclosing circle 20 ft. in height. The other letters grade off in size to 7 ft. high.

The flasher, in order to furnish the effect of a hoop rolling from the left to the right and back again, is unusually large, being 6 ft. long and about as high. The contactors, of which there are about 159, are arranged in seven tiers one above the other with the spindles connected by gears. The flasher is installed at the middle of the back of the sign in a sheet-metal cabinet so that the wiring is reduced to a minimum. The sign was designed and built by the Federal Sign System (Electric), and the flasher was furnished by Betts & Betts, New York.

RECENT TELEPHONE PATENTS

Telephone Lock

Mr. J. W. Harvey, of Sunset, Tex., has invented a telephone lock. This consists of a link chained to the base of the instrument, a hasp piece, which loops over the hook switch, and a padlock for so securing the hasp and the link that the hook switch lever cannot rise.

Switchboard Systems

Usually as soon as a telephone call is established the line signals of both the calling and called lines are out of circuit and the cord signals are substituted. The line signals cannot be operated again until the plugs are removed or the connection is taken down. In a system patented by Mr. E. E. Corwin, of Chicago, either subscriber may control his line signal irrespective of plugs. The relays are so arranged that the subscriber may restore his cut-off relay at will. This restores the line signal.

Mr. W. A. Fricke, of Chicago, has also invented a manual switchboard circuit system. Use is made of a two-wire jack and cord. The talking and signaling battery is fed to the lines through relays acting as retardation coils. No battery is connected to the cord circuits. Mr. Fricke's patent has been assigned to the Monarch Telephone Manufacturing Company.

An automatic system employing jacks and plugs has been invented by Mr. F. S. Coulter, of Livonia, Ind. The jacks are arranged upon a hollow cylinder in horizontal rows. The plugs are mounted within radial arms which are spring-driven by a control shaft. Each pair of plugs is wired to a particular line. When a connection is desired the plugs are stepped opposite to jacks of the desired line, whereupon the plugs of the calling line are forced out from their sockets in the radial arms and into the jacks. This is done by an electromagnet riding upon the arm. The shaft may be moved as required, as the arm in use is locked by the jacks and the spring connection with the shaft is sufficiently flexible so that no harm results. One arm is used for each line, and each arm is presented to the jacks of every other line in one of its angular positions.

Letters to the Editors

Emergency Radio Apparatus

To the Editors of the Electrical World:

SIRS:—I have read with a great deal of interest the articles in your issue of Feb. 7, 1914, entitled "Emergency Service Radio Apparatus" and "Government Radio Supervision," and while I most heartily indorse the sentiments expressed therein, feel that a statement which might lead a layman, or one not acquainted with the development of radio communication, to believe that such conditions exist on *all* steamships leaving the United States or foreign ports should not remain unchallenged.

From the time that radiotelegraphy demonstrated its usefulness as a communicating medium, especially in the matter of safety of life at sea, it has been—and it is to-day—the United Fruit Company's policy to keep abreast of the times, and to this end each of its vessels has been equipped with the most modern and efficient radio apparatus obtainable either at home or abroad. This company also maintains a separate department the duty of which it is to supervise the installation and operation of this equipment and to see that it meets not only the requirements of the law but the company's rules and regulations, which are even more exacting than those of the government.

The difficulty which Mr. Marriot, the government inspector, experienced with certain installations mentioned in your article could not possibly occur on a United Fruit Company's vessel, for the reason that the 10-in. coil, or "plain aerial" emergency equipment, was discarded in June and July, 1913, and storage batteries were installed on each boat sufficient to operate the regular 2-kw radio equipment as well as to furnish energy for a system of emergency lamps on all decks and passageways and in the vicinity of lifeboats.

The radio apparatus of each ship is installed in such a manner as to permit of its being operated from either the ship's main or the storage batteries, and, in case of an accident to the generator, the radio apparatus can be connected to operate from the storage batteries by merely throwing a switch.

Recent tests of the storage-battery equipments demonstrate that they are not only capable of furnishing energy for twenty-five or thirty emergency lamps on the decks and in the passageways but will also operate the radio apparatus for from twelve to thirteen hours with a minimum range of communication of 250 miles under average atmospheric conditions, and will operate the radio apparatus on full power for a period of seven hours, permitting a range of communication of from 450 to 500 miles in daylight under adverse atmospheric conditions; that is, with a medium amount of static. I might mention here that the average daylight range of communication of the United Fruit Company's ships is 600 miles under average atmospheric conditions, and during the storage-battery tests it was demonstrated that a ship could maintain this range, handling its ordinary business, throughout a voyage of twenty-one days, transmitting on an average 300 words per day.

On the United Fruit Company's 10,000-ton steamships *Pastores, Tenadores* and *Calamares* two complete radio equipments have been installed, one a 2-kw set and the other a 1-kw set, both of the latest quenched-spark type and arranged to be operated from either the ship's mains or the storage batteries. The government inspectors at New York—and in fact all radio engineers who have visited these ships—have stated on various occasions that these three had the best radio equipment of all ships afloat, and in these circumstances it is obvious that our ships should not be included in the category of those mentioned in your article, as it is self-evident that their emergency or auxiliary apparatus "is really worthy of the name," a fact which has been recognized by the Department of Commerce and to which the government radio inspectors have willingly testified.

As a matter of interest I would also call your attention to the fact that the United Fruit Company was the first steamship company to recognize the value of a complete storage-battery equipment in connection with the operation of ship radio apparatus in the matter of safety of life at sea, and was the first to install such equipment as well as to provide for emergency lamps operated by the storage batteries, arranged so that there will be ample light on each deck remaining above water in case of an accident. Neither of these precautions is necessary in order to comply with the letter of the law.

In furtherance of its policy of keeping abreast of the development of radio apparatus, the United Fruit Company some time ago arranged for the installation, on the *Pastores*, for test and demonstration purposes, of the Marconi-Bellini-Tosi radio direction finder, which, it is claimed, will enable a navigating officer of a ship to take bearings of radio ships and stations with the view to finding the position of his ship or avoiding collision with other ships in fog. If this apparatus is satisfactorily demonstrated it will be added to the radio equipment of the United Fruit Company's vessels, and its use will tend to prevent collisions in fog such as that which occurred between the *Nantucket* and the *Monroe*.

New Orleans, La. GEO. S. DAVIS.

The "Half-Watt" Lamp in Photography

To the Editors of the Electrical World:

SIRS:—In your issue of July 18, 1914, there appears an article entitled "The High-Efficiency Tungsten Lamp in Photography," by Mr. M. Luckiesh, and also an editorial entitled "The 'Half-Watt' Lamp in Photography." In the editorial I notice the following: "In many places it would be very convenient to employ incandescent lamps on account of their extreme steadiness and the ease with which they are used on alternating current, the mercury-vapor lamps requiring special adaptation for this purpose."

Allow me to call your attention to the facts that mercury-vapor lamps are as steady in operation as incandescent lamps and that no adaptation is required when these lamps are run on alternating current. Alternating-current mercury-vapor lamps have been on the market for the past six years and their photographic value is the same as that of the direct-current lamps. Therefore I feel that the statement which has been made in this respect is eminently unfair and would ask that you kindly make correction accordingly.

WILLIAM A. D. EVANS,
Commercial Engineer, Cooper Hewitt Electric Company.
Hoboken, N. J.

[We certainly have no intention of reflecting on the usefulness of the mercury-vapor lamp. It is, however, true that the ordinary incandescent lamp not only is extremely steady—probably the steadiest of all artificial illuminants—but that it is absolutely interchangeable on direct and alternating currents. As our correspondent indicates, the mercury-vapor tube is not interchangeable, although a special form of it has been, we are glad to emphasize, very successfully adapted to use with alternating current.—EDS.]

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Energy Exchange for Electric Utilities in Central Ohio

Substation equipment has been installed at Lima, Ohio, to permit emergency energy exchange between the Western Ohio Railway Company, the Ohio Electric Railway Company and the latter's subsidiary, the Lima Electric Railway & Light Company.

Under normal conditions the Fort Wayne, Defiance and Toledo divisions of the Ohio Electric Railway Company are operated with energy generated at Medway (between Springfield and Dayton) and transformed in the new substation. In case, however, of a breakdown or overload at the Medway station the supply of the Western Ohio company will be substituted or used to assist in carrying the load. As the equipment in the station of the Lima electric company is already operating at about its full rating, the energy exchange connection will also be utilized by that station in emergencies to supply lamp and motor service.

As the transmission systems of the Western Ohio and Ohio Electric Railway Companies formerly operated at 33,000 volts and 26,400 volts respectively, it was necessary to install a 1500-kva step-up auto-transformer at Medway to make the voltages agree. An auto-transformer was employed as the expense of installing it was less than that of replacing the double-coil transformers with units of the proper voltage ratio. Although the transformers installed in the substations along the right-of-way operated at 26,400 volts prior to the exchange connection, the units were originally designed for 33,000 volts, making it a simple matter to change taps when the systems were unified.

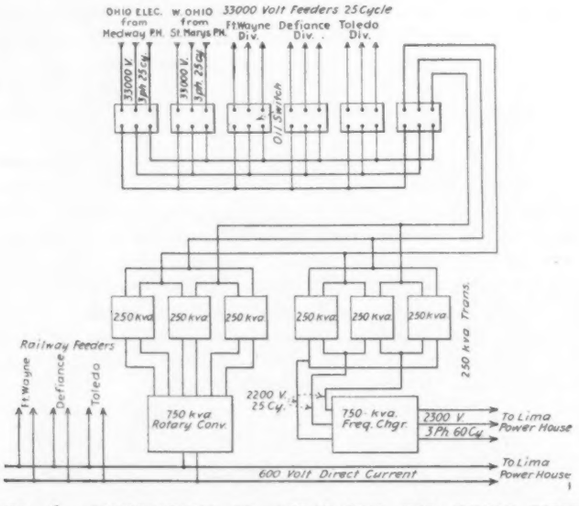


FIG. 1—CONNECTION OF APPARATUS FOR TYING LINES TOGETHER AT LIMA

The equipment of the substation which is used for tying in the two transmission lines consists of six 250-kva air-cooled transformers, one 750-kw rotary converter, one 750-kva frequency changer and the necessary oil switches and disconnecting switches.

The connection of this apparatus for supplying energy to the interurban lines and to the local distributing lines in Lima is shown on an accompanying diagram. The frequency changer was installed to assist the Lima generating station in case the engine-type generators used there should break down or it was desired to take one or more of them out of service for other reasons. The frequency-changer set, which is connected to the 33,000-volt, twenty-five-cycle lines through three delta-connected transformers, changes the frequency from twenty-five cycles to sixty cycles, delivering energy at 2300 volts to the city distribution lines. When the set is not desired for this purpose the motor of the frequency changer is floated on the substation bus to correct the power-factor of the 33,000-volt line.

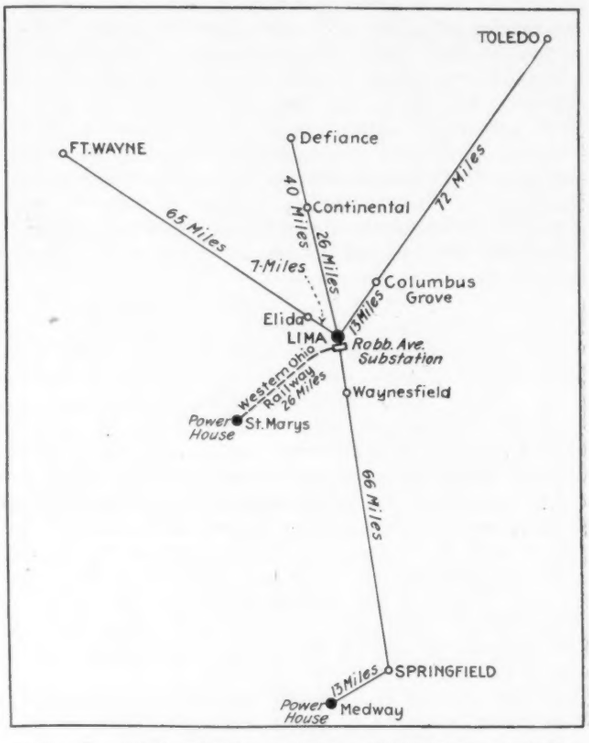


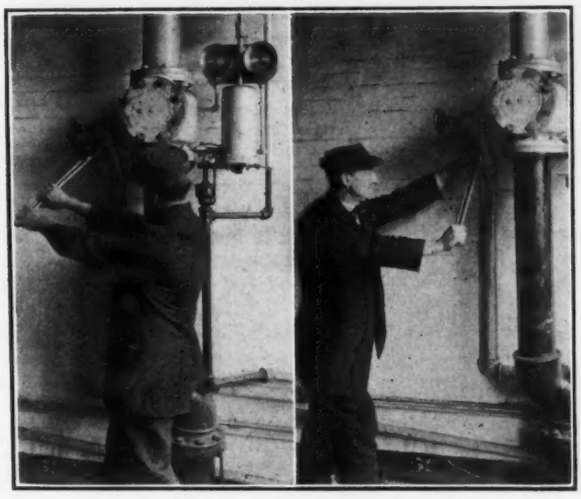
FIG. 2—HIGH-TENSION LINES CONNECTED TO ROBB AVENUE SUBSTATION

The rotary converter, which is supplied with energy from the 33,000-volt, twenty-five-cycle line through three delta-connected, oil-cooled transformers, delivers 600-volt direct current to four divisions of the interurban line as well as the city railway line in Lima. The rotary can also be used to replace or assist the 300-kw rotary converters installed at the nearest substation on the four divisions—namely, Elida, Continental, Columbus Grove and Waynesfield—or perform the same service in connection with the railway generators installed in the Lima power house.

All the apparatus mentioned in accomplishing this change was furnished by the Westinghouse Electric & Manufacturing Company.

The Right Way to Hold a Pipe Wrench

One who has more confidence in his pushing than his pulling power may regret his failure to develop the latter if he has much occasion to use a pipe wrench and has skinned his knuckles when the wrench slipped or the pipe suddenly responded to the force tending to turn it. The accompanying illustrations show the



FIGS. 1 AND 2—THE SAFE AND UNSAFE WAY TO USE A PIPE WRENCH

right and the wrong way of using such a wrench. The man loosening a pipe in the manner shown in Fig. 2 would be likely to bruise his hand severely if the wrench slipped. But with the wrench held as shown in Fig. 1 there is no danger of injuring the knuckles even if the wrench should fail to hold. These illustrations are among the series which have been used by the Rochester (N. Y.) Railway & Light Company to educate its employees in avoiding accidents.

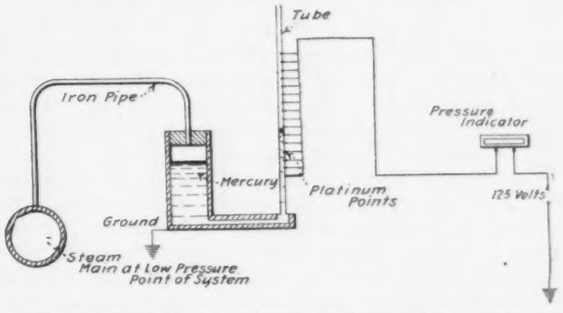
Recording Pressure Gage for Steam-Heating System

Desiring a closer check upon the steam-heating system in his city, Mr. Thomas F. English, manager of the Muncie (Ind.) Electric Light Company, recently endeavored to purchase a meter which would indicate in the station the pressure which was being maintained in the steam pipe at some distant point known to be the point of lowest pressure on the system. At that time there was no such device on the market, and the instrument shown in the accompanying illustration was designed by Mr. English to meet this particular condition.

Referring to the illustration, a ⅛-in. iron pipe from the steam main admits steam to the larger cylinder of a mercury cup, and as the mercury rises and falls in the tube attached to the mercury cup it makes contact with the platinum points at the terminals of the adjacent resistance. A variation of 1 lb. in the pressure in the steam main moves the smaller mercury column 2 in. A single-wire circuit with ground return leads from the resistor to a 125-volt source of energy and to an indicating voltmeter in the station. The scale of the voltmeter in the station is calibrated to read directly in pounds and ounces of steam pressure, so that as the mercury column moves along the platinum points varying the amount of resistance in the circuit, the scale of the voltmeter tells the station operator what the steam pressure is at the point of low pressure, 1500 ft. from the station.

With this system there need be no time when the engines are delivering excess steam to the heating system, and by the proper manipulation of the load the Muncie company estimates that it can effect a saving of 20 lb. of steam per hour for every kilowatt of load that it is possible to transfer from the engine unit to the turbine.

A further advantage of the instrument is found in the fact that when complaints of low pressure are received the trouble-man can rest assured that he will find the fault on the customer's premises and save himself con-



STEAM-PRESSURE INDICATOR FOR HEATING SYSTEM

siderable time by making the building of the complainant his first objective. The greatest saving is effected, of course, on moderate days when the turbines can advantageously take over the greatest part of the load from the heating engines.

Causes of Honeycomb on Flue Sheets

What is the cause of the honeycomb structure sometimes formed on flue sheets? Can this formation be avoided by the proper selection of fuel? A. J. W.

The formation of honeycomb is doubtless contributed to by the presence of excess ash material and sulphur in the fuel. In this connection it is interesting to note that the fine material produced in the ordinary process of mining has a higher percentage of both ash and pyrites (iron sulphide) than is present in lump coal taken from the same mine. In a series of tests conducted by Prof. S. W. Parr of the University of Illinois on samples of coal from seventy-five mines in that State, each mine being represented by one sample of screened lump coal and one of screenings, the results showed an almost uniform ash percentage in the screenings, at least double that of the ash in the lump coal. In run-of-mine coal the product is somewhat deceiving, having the appearance in the mass of being very largely lump material. Of course, it is possible for occasional car loads of run-of-mine coal to be fully equal to the best screened lump from the same mine, but the fine material must sooner or later come along somewhere in the output. After the blast and the breaking down of the coal at the working face the miners enter and clean up the rooms by sending out first the coarse or lump material. At the clean-up, which is made before the new drill holes are started, that part of the underlying floor which has been more or less pulverized and loosened in the various processes is shoveled up and sent out along with the coal. In this way it is evident that the fine material will be much higher in ash and will moreover contain mineral constituents which usually are in themselves higher in sulphur. Therefore, in run-of-mine material there will often occur exactly those physical conditions of fineness of division and high content of iron pyrites which are productive of pasty particles that can be made to grow by small accretions, finally forming a honeycomb structure on the flue sheets.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Cascade Induction Motor.—L. J. HUNT.—A paper read before the Manchester Section of the (British) Institution of Electrical Engineers. The author describes step by step the development of the cascade motor and also deals with two-speed and three-speed motors.—London *Electrician,* July 17, 1914.

Transformer Construction.—A note on a recent British patent (No. 11,539, 1913) of R. Arno. The specification describes a method of obviating the possibility of leakage through the iron cores from the high-tension windings to the low-tension windings. The respective windings are made upon separate cores which are insulated from one another by thin sheets of mica or other material. To compensate for the increased reluctance, the section of the cores is considerably enlarged at the joints. As an additional safeguard the cores on the low-tension side may be grounded.—London *Elec. Eng'ing,* July 16, 1914.

Lamps and Lighting

Electrolytically Produced Luminosity.—L. H. WALTER.—A brief note on a recent Royal Society paper entitled "Application of Electrolytically Produced Luminosity, Forming a Step Toward a Form of Telectroscopy." The author has investigated the conditions under which it should be possible to make practical use of the luminosity of anodes of alloyed aluminum forming parts of a "valve" cell arrangement. The alloy known as "duralumin" is found to give the best results, and, with sodium tungstate solution as electrolyte, corrosion is practically eliminated when this alloy is used as the anode. The difficulties with immersed anodes led the author to employ anodes which are completely dry, except for the front surface, which is kept wet by a layer of electrolyte flowing down it in a continuous stream, the flow being distributed by a transparent crape screen which clings to the anode surface. The anode being, in this way, dry at the back, electrical connection can be directly established there, without the great care as to insulation otherwise needed. This arrangement permits of the construction of an apparatus having a multiple anode comprising a vast number of equal units in quite a small compass, each such unit being capable of being rendered luminous in any order or sequence desired and at a speed of some hundreds of times per second. In the author's experimental apparatus there are over 5000 such separate units in a space the size of a cabinet photograph—a number which it would hardly be possible to obtain by other means. Such an apparatus is capable of being employed as a receiver for photo-telegraphy for the reproduction of pictures, etc., especially where these are received as electrical impulses. It constitutes a step toward one form of telectroscopy, the luminous reproduction at some receiver of an object visible at some distant, electrically operated transmitter.—London *Electrician,* July 10, 1914.

Mercury-Vapor Lamp.—F. A. EBERT.—An illustrated article on mercury-vapor lamps especially designed for photographic purposes, for making blueprints, etc.—*Zeit. f. Beleucht.,* June 10, 1914.

Generation, Transmission and Distribution

Differential Equations of Long-Distance Transmission.—GEORGE R. DEAN.—The first part of a mathematical paper in which the following problems are considered: (1) General equations and solutions for a single-phase line under steady conditions; (2) solution for line of infinite length with generator of given impedance, the frequency for such voltage being a simple advancing wave; (3) solution for line of finite length, open at receiver end; (4) solution for line of finite length short-circuited at receiver end; (5) solution for line of finite length, with known impedance at receiver end. In the present instalment the first two problems are dealt with.—London *Electrician,* July 17, 1914.

Traction

Rail Feeders for Electric Railways.—HENRY M. SAYERS.—An illustrated article in which the author considers the use of rail feeders for electric railways, resistance being used to obtain equal drop, as compared with the use of boosters. Calculations are given for two cases using the resistance method, and it is shown that in some cases the latter may give a slightly lower cost than the boosters. The method is, therefore, worth considering, but has certain disadvantages.—London *Electrician,* July 17, 1914.

Albtal Single-Phase Railroad.—NOELDECKE.—An abstract of a paper on electric traction on the Albtal railroad near Karlsruhe. The single-phase system is used, the pressure being 8800 volts and twenty-five cycles, while in the city of Karlsruhe single-phase energy at 700 volts is employed. Considerable trouble was experienced on account of the induction effects produced on telephone lines in the neighborhood.—*Elek. Zeit.,* July 9, 1914.

Installations, Systems and Appliances

Rate Schedules of Different Countries.—G. SIEGEL.—The first part of an article in which the author points out that the rates in use in different countries depend on the local commercial, climatic and geographic conditions of the country and that the nature of the rate also indicates the extent and the importance of electricity supply in the country. From these viewpoints the author discusses rates in use in various European countries. In Germany a great variety of rates are in force; the majority of these allow discounts according to the amount of energy sold. Of 250 stations, 118 stations use such a discount system in selling lighting service, and 122 use it for motor service. Discounts, depending on the number of hours of use of electricity, are allowed by forty stations for lighting and forty-three stations for motor service. Double-rate schedules are in use in sixty-three stations for motors and in forty-four stations for lighting. Separate flat rates for lighting and for motor service without further discounts are charged by forty stations, most of them in very small towns. The average price for lighting was 17.5 cents per kw-hr. up to 1896, the unit of that time being the hecto-watt-hour, instead of the kilowatt-hour. From that time until 1902 or 1903 the average price for lighting was reduced to 15 cents per kw-hr., and it has

since decreased with few exceptions to 12.5 cents or less. The prices for motor service have varied to a smaller extent. The rate of 6.5 cents per kw-hr. which was introduced in the beginning is still employed in some cases, although most stations have now a fundamental rate of 5 cents. Stations with still lower base rates are in the minority. In Austria 64 per cent of the number of all stations, with an aggregate rating of 50 per cent of the rating of all stations, use totally or partly water-power. This suggests the reason why flat rates are common in Austria. Out of 736 stations, 240 use a flat rate, 142 a combined meter and flat rate, 179 a meter rate without discount, 167 a meter rate with discount, and eight a double rate for lighting. The prices for lighting vary from 4 cents to 21 cents, the average being 15 cents per kw-hr. The prices for motor service vary from 2 cents to 15 cents, the average being 6.75 cents per kw-hr. Switzerland has a greater variety of rates than any other country. Not only are different types of meter rates employed but flat rates are also applied in great numbers and with numerous modifications. Out of 233 stations, fifty-six use flat rates, fifty-nine meter rates and 118 both flat rates and meter rates. In the case of flat rates for lighting, different schedules are charged according to the probable hours of use and also according to the nature of the rooms to be lighted. In the use of a flat rate for motor service the rate depends on the kilowatts connected and the probable hours of demand. With respect to the latter point a distinction is usually made between the following three classes: First, motors for factories, in which the working hours are restricted by law to eleven hours per day; second, motors for use during the day only; third, motors which can be used continuously. Discounts are often allowed, depending on the size of the motor. For instance, according to one rate commonly used, the price per kw-hr. is 2.5 cents for motors from 1 hp to 3 hp, 2.4 cents from 3 hp to 10 hp, 2.3 cents from 10 hp to 20 hp, 2.1 cents from 20 hp to 30 hp, and finally 1.5 cents from 100 hp to 200 hp. A distinction is also made in the prices of service taken in the summer and in the winter. In France the prices for electrical energy are relatively high, and for this reason electricity supply has not yet reached the same commercial importance as in other countries. Of 2020 towns, seventy-three towns pay more than 20 cents per kw-hr. for lighting, 351 towns pay 20 cents, 617 towns pay 16 cents to 20 cents, 873 towns pay 12 cents to 16 cents, and only 106 pay less than 12 cents per kw-hr. The article is to be completed.—*Elek. Zeit.*, July 16, 1914.

Electrophysics and Magnetism

Production of Very Soft Roentgen Radiation by the Impact of Positive and Slow Cathode Rays.—J. J. THOMSON.—An abstract of a British Physical Society paper. Roentgen and his pupils had always held that light waves were identical in nature with electrical waves produced by mechanical means, but there existed a gap (on which very little work had been done) between the longest infra-red radiation and the shortest electrical wave that could be mechanically produced. Roentgen believed the investigation of this gap to be essential to the proper study of the constitution of the atom. The work already done on X-rays had demonstrated the existence of two separate rings of electrons in the atom, one within the other. These rings were responsible for the K and L types of radiation respectively. The L radiation was so much softer than the K type that if a third ring of electrons existed the radiation from which was proportionately softer than that of the L type, this radiation would fall well within the gap already mentioned. In the first experiment described a special form of discharge tube was employed. The positive rays passed through a tubular perforation in the cathode and impinged obliquely on a metal target. A photographic plate of the Schumann type was situated at the further end of a branch tube in such a position that no solid obstacle interposed between the target and the plate. When the discharge passed between the electrodes the photographic plate was affected. The application of an intense transverse electrostatic field between two metal plates situated between the cathode and the target completely stopped the effect, showing that the latter was not due to stray radiation reflected from the target, since, while charged particles would be swept to one side, radiation would not be affected by the field. Hence the passage of positive particles from the cathode to the target was essential. On the other hand, a strong transverse electrostatic field in the branch tube had no effect, showing that radiation was passing between the target and the plate, which was not, therefore, merely affected by positive particles rebounding down the side tube after impact on the target. The properties of this radiation were intermediate between ordinary X-rays and Schumann waves. They were susceptible to reflection by metal surfaces, and their penetrating power was very small. They were completely stopped by the finest collodion film obtainable. It was shown that the quality of the radiation did not depend on the energy of the moving particles which gave rise to it, but on the velocity. Hence equally soft rays should be produced by cathode particles if these were traveling as slowly as the positive rays. A discharge tube was constructed in which the cathode rays, leaving the cathode with the ordinary velocity, could be subjected to a retarding electrostatic field of variable strength before impinging on the target. In this way the velocity of impact could be varied over a large range, and radiations were obtained varying in quality from ordinary X-rays to the so-called Schumann waves. It was hoped by the study of these radiations to be able to determine not only the number of rings of electrons within the atom but the number of electrons in each ring.—London *Electrician*, July 17, 1914.

Units, Measurements and Instruments

Measuring Time Constants of Low Resistance.—F. WENNER, E. WEIBEL AND F. B. SILSBEE.—An abstract of an American Physical Society paper describing two new methods for measuring the time constants of low resistances and giving the results of tests made with these methods. All values heretofore obtained for the

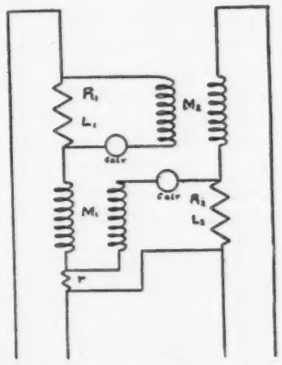


DIAGRAM OF CONNECTIONS

residual inductance of "non-inductive" standards of low resistance have been based upon the calculated inductance of some conductor. This calculation of the inductance from dimensions involves serious assumptions as to current distribution, inductive effects in potential leads, etc. The first method described by the authors

gives primarily the sum of the time constants of the two resistances used. By using three resistances three sums can be measured from which each time constant can be obtained, without calculation of the inductance of a resistance standard. In applying this method the resistances are each connected in series with a mutual inductance, as indicated in the cut, and are excited by alternating currents substantially in quadrature. The constants of the circuits are then adjusted so that no current flows in either galvanometer. It can easily be shown that the following relations then hold:

$$R_1R_2 = p^2 (M_1M_2 + L_1'L_2) \qquad (1)$$

and

$$\frac{pL_1}{R_1} + \frac{pL_2}{R_2} = \frac{prM_2}{R_1R_2} \text{ or } \frac{r}{pM_1} \text{ very closely,} \qquad (2)$$

where $p = 2\pi \times$ frequency. The first of these equations can be used in the absolute measurement of resistance and the second gives a measure of the sum of the phase angles of the two resistances. This method requires (1) that the mutual inductance be pure, i.e., give emfs in exact quadrature with the primary current, (2) that the frequency be held very constant during the measurement, and (3) that the current be sinusoidal or that the detectors be sufficiently selective to the fundamental frequency. The second method makes use of a standard whose resistance can be changed without changing its inductance. This can be done, for example, by using a copper standard whose temperature can be varied. Then, if the observed decrease in phase angle be d and the corresponding proportional increase in resistance be a, we have

$$\frac{pL}{R} = \frac{1+a}{a}\, d.$$

This method requires merely an accurate measurement of the change in the phase angle.—*Phys. Review*, July, 1914.

Telegraphy, Telephony and Signals

Loading Duplex Telephone Lines.—A note on a recent British patent (No. 8185, 1914) of H. B. M. Pleijel and A. H. Olsson. The present practice of loading overhead lines is to employ double coils for each pair of lines. The stray fields produced are undesirable, as they give rise to eddy-current losses in the metal casings, with consequent damping. When these lines are duplexed special duplex loading coils are necessary. The above specification describes a method of loading whereby no extra duplex loading coils are required. The double coils for each pair of lines are inclosed in a case made of non-conducting, non-hygroscopic material, such as glass, and the coils are made of a size sufficient to produce a considerable stray field. This stray field is utilized to produce the necessary self-induction for the loading of the duplex line, so that extra loading coils are unnecessary. Owing to the coils being inclosed in non-conducting cases, the eddy-current losses due to the stray fields are extremely small. Lightning arresters are fixed in each case.—London *Elec. Eng'ing*, July 16, 1914.

Miscellaneous

Electrical Accidents.—An abstract of the annual report of G. Scott Ram, the electrical inspector of factories in Great Britain. The electrical accidents are remarkably few in view of the large number of electrical stations now in operation. Although the number of accidents is greater than in the previous year, it is no larger than it was five years ago. In electric generating stations and substations there were 439 non-electric and ninety-four electric accidents. Of the latter forty-six occurred while men were cleaning or making repairs about live switchboards or other live conductors. Two of these accidents were fatal. A second table gives the electric accidents in 1913 in places other than electrical stations, the number being 418, of which seventeen were fatal. A third table gives the fatalities due to electricity reported under the factory and workshop acts in 1913. No less than twelve of those fatalities were due to shock from alternating current at potentials probably not exceeding low pressure (440 volts or less).—London *Electrician*, July 17, 1914.

Book Reviews

THE YEAR BOOK OF WIRELESS TELEGRAPHY AND TELEPHONY. 1914. New York: Marconi Publishing Corporation. 742 pages and map. Illus. Price, $1.

A large amount of useful information is included in this volume, among which may be mentioned a chronological record of the development of wireless telegraphy from 1831 to the end of 1913, a full report of the international convention on safety of life at sea held in January, the laws and regulations regarding wireless telegraphy of the principal countries of the world, a list of all the land and ship stations of the world, and some valuable articles. A summary of the wireless telegraphy patents issued during 1913 and many other useful data are also given. The compilation has been well done.

MUNICIPAL OWNERSHIP OF STREET RAILWAYS IN THE DISTRICT OF COLUMBIA. New York City: The Bureau of Public Service Economics. 72 pages. Price, 50 cents.

This is an abstract of the testimony presented at hearings before the committee on the District of Columbia of the House of Representatives from May 13 to June 6, 1914, on the bill providing for public ownership of the electric railways in the District. Mr. William D. Kerr, director of the bureau, says in the preface to the booklet that the number of those who are interested in the subject is large enough and Congressional consideration of municipal ownership is important enough amply to justify an abstract which renders available a comprehensive summary of the entire record. The abstract is the essence of a published volume of 543 pages which contained the original testimony. It presents the municipal ownership issue as it stands now and will be of present and reference value to those who are interested in this question.

THE PRACTICAL TELEPHONE HANDBOOK AND GUIDE TO THE TELEPHONE EXCHANGE. By J. Poole. New York: Whittaker & Company. 624 pages, 535 illus. Price, $1.50.

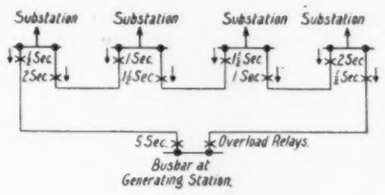
This is the fifth edition of this comprehensive handbook, which has long been recognized in many quarters as a standard. With the present enlargements fuller treatment is given to automatic and wireless telephony, the theory of artificial lines, recent exchange layouts, coin call boxes, the much-discussed "wired-wireless" telephone, etc. The thirty-five chapters cover nearly all phases of telephony, though there is no pretense that in the single volume the entire subject could be treated exhaustively. British practice is followed closely, and it is noteworthy that in many of the most important branches this is directly in line with American methods. The book opens with an introductory discussion of electrical principles, laws and elementary apparatus, whence the reader derives a bit of telephone history, being then led successively into descriptions of receivers, transmitters, substation apparatus, switchboard and signaling instruments, exchange layouts for both local and common-battery working, traffic and line studies, cables, and faults and measurements.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Reverse-Power Relays for Ring-Type Systems

Reverse-power relays made by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., are provided with definite-time-element characteristics by means of torque compensators, so that they can be used for protecting certain ring-connected distributing systems where differential relays with expensive pilot-wire connections would otherwise be required. The diagram

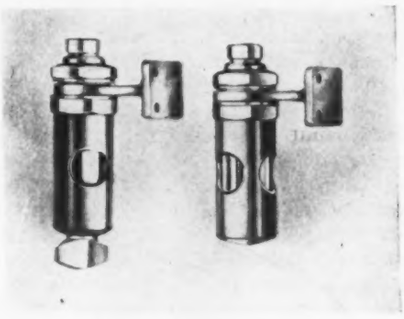


RING-TYPE SYSTEM

shows a typical system of this kind. The relays can trip only when the overload is in the direction shown by the arrows. Each relay is set for the definite minimum time indicated. If a ground occurs on either feeder or connecting line energy flows to that point from both ends. The relays nearest the fault on each side will trip first, thereby cutting out the defective line but not interrupting the supply of energy to the substations. In case of a heavy short-circuit near the substation the voltage may drop very low, but these relays, it is declared, are so sensitive that they will operate correctly even if the voltage drops to 2 per cent of normal.

Automobile Lighting System.

A 12-volt lighting system for automobiles is being made by the Bosch Magneto Company, 223 West Forty-sixth Street, New York. The generator is a shunt-wound machine of waterproof construction regulated externally. The reflectors of the head-lamps are designed so that abundant light, free from patches or blinding back-glare, is projected at a very wide angle,



FIGS. 3 AND 4—TAIL-LAMP AND DASHBOARD LAMP

enabling the driver to see both sides of the road and at the same time to have a clear view ahead for a considerable distance. The side-lamps are similar in design to the head-lamps except that the reflector is mounted on a frame which is not equipped with a door. Units of 25 cp are used in the head-lamps and 8-cp lamps in the side-lamps.

The tail and dashboard lamps manufactured for use with this system of automobile lighting are of tubular form, as shown in Figs. 3 and 4.

Portable Electric Drill

The convenient electric drill illustrated herewith is made by the Independent Pneumatic Tool Company, of Chicago. It is equipped with a universal motor, and ball or roller bearings are used. The pinion on the armature shaft is removable and can be easily replaced when worn. Likewise the internal gear into which the

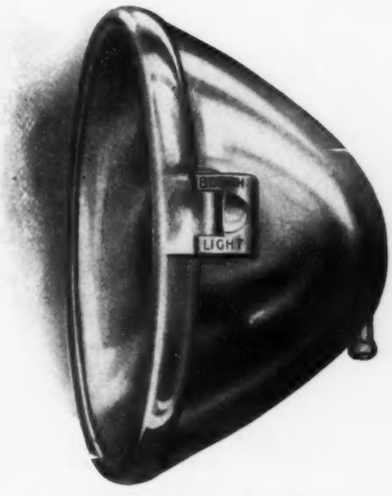
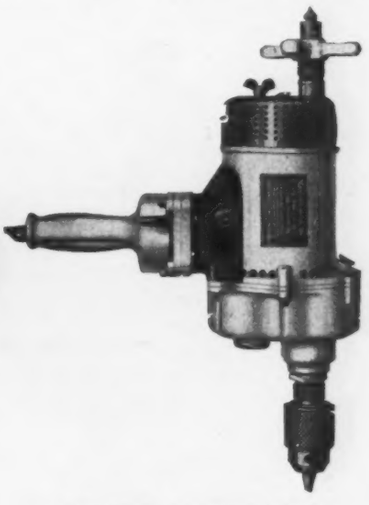


FIG. 1—HEAD-LAMP

FIG. 2—SIDE-LAMP

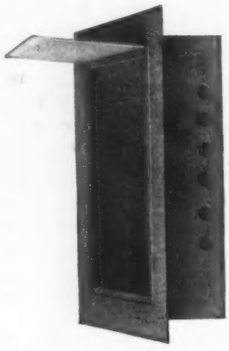


PORTABLE ELECTRIC DRILL

pinion meshes is replaceable. The gears are comparatively large in diameter, minimizing friction. The motor-brush cover may be removed easily, and the commutator can be cleaned, if proper care is exercised, while the drill is running. Ample provision is made for ventilation; the fan is keyed on the motor armature shaft. The manufacturer declares that this Thor drill is the most powerful machine for its weight of all on the market at the present time.

Cutout Box

A flush-type cabinet for cutouts is being made by the Greater New York Metal Box Company, 60 Grand Street, New York. The trims of the cabinet are fitted



FLUSH-TYPE CUTOUT BOX

with an angle-iron frame, one leg of which acts as a rabbet around the door and the other extends inside the box, forming a frame around the edges of the box. The trim is fastened to the angle iron. The door is attached to the box by special hinges which are not riveted.

Washing Machine with Swinging Wringer

A washer equipped with a pivoted wringer, which can be operated in three different positions, is shown in the accompanying illustration. The tub is corrugated and is made of cypress. A handle can be used in case the motor fails. The wringer is a two-roll reversible device in easy reach of the operator. By means of the swinging feature the wringer can be used with the washer, the rinse tub or the basket. The wringer may be used while the washer is in operation. This washing

WASHER WITH PIVOTED WRINGER

machine is being placed on the market by the Getz Power Company, Morton, Ill.

Overload Series-Gap Lightning Arresters Utilized by Adding Resistance

By connecting carbon resistors in series with its formerly overloaded series-gap lightning arresters, the Wilmington & Philadelphia Traction Company, Wilmington, Del., has been able to utilize its old arrester equipment without subjecting the arresters to the danger of being destroyed by the flow of generator energy following a lightning discharge across the gap. The resistors used consist of 120-ohm carbon rods inclosed in weatherproof tubes of micarta or bakelite of large enough internal diameter to accommodate a filler

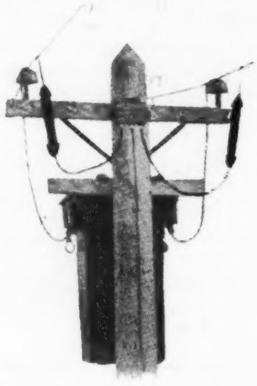


FIG. 1—GAP ARRESTER AND RESISTORS FOR TRANSFORMER INSTALLATION

of insulating compound. No. 8 rubber-insulated, flexible wires, passing through impregnated locust-wood caps inserted in each end of the tube, are attached to the ends of the carbon rod. The wooden caps contain counter-sunk holes for the wires and are fastened to the inclosing tube in a thoroughly secure manner by means of fiber pins.

One thousand of these resistor units are now being used by the company with entire satisfaction. As the cost is very low, it has been found practicable to place a series-gap lightning arrester so equipped at each transformer.

The accompanying illustrations (Figs. 1 and 2) show installations of these units which were furnished by the Railway & Industrial Engineering Company, Greensburg, Pa.

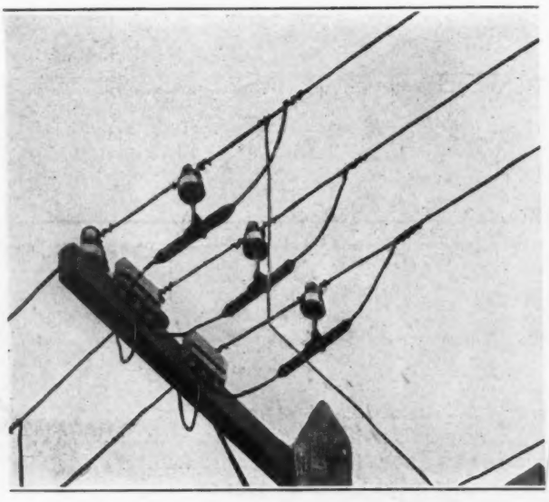


FIG. 2—POLE-TOP CARBON LIGHTNING-ARRESTER RESISTOR

Semi-Fluid Lubricant

"Lesoyl," a semi-fluid lubricant containing suspended graphite particles, is being produced by the Lumen Bearing Company, Buffalo, N. Y. This product, which can be readily mixed with light or heavy oils or grease, performs two functions: (1) It distributes an excellent lubricant, graphite, over all parts of the bearing surface, and (2) it maintains an unbroken oil film thereon. According to tests made at the laboratories of Cornell University, lubricating oil containing 0.25 per cent of lesoyl permitted bearings to withstand an increased pressure of 50 lb. per sq. in. By mixing this product with oil it is declared that a thicker oil film can be maintained on bearings, scoring can be prevented if lubrication is interrupted, and oil consumption can be reduced more than 50 per cent. Lesoyl is made by mixing graphite with a fluid which has a strong capillary affinity for it and grinding the mass sufficiently to prevent the particles settling when mixed with oil.

Wire-Stripping Pliers

Electricians' pliers designed to strip wire of cloth or silk-braided insulation are being manufactured by the Smith & Hemenway Company, 150-152 Chambers Street, New York City. The tool is modeled along the lines of

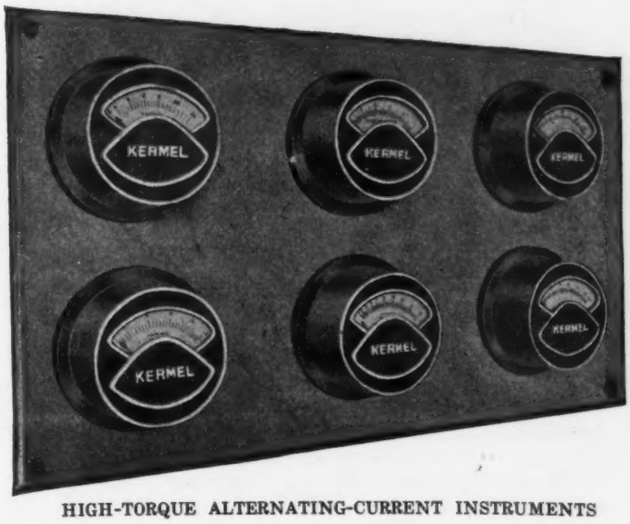
WIRE-STRIPPING PLIERS

the ordinary diagonal pliers, and the stripping device has been placed in the cutting edges so as not to interfere with wire cutting. Insulated wires as small as No. 22 B. & S. gage can be stripped with the new tool.

Alternating-Current Indicating Instruments

Alternating-current voltmeters, ammeters and wattmeters which are declared to indicate accurately within 1 per cent, regardless of wave-form, frequency or temperature, are being manufactured by the Kermel Apparatus Company, Cambridge, Mass. The operation of the voltmeters and ammeters depends on the repulsion between magnetized pieces of steel, one stationary and the other movable. The wattmeters, which operate on the electro-dynamometer principle, are unique in that the magnetic circuit is part iron and part air. The moving elements in the potential and current-indicating instruments weigh only 1.5 grams and those in the wattmeters 4.3 grams. The ratio of torque to weight is very large in these instruments, 0.2 cm-gram being the torque in the ammeters and voltmeters for full-scale deflection.

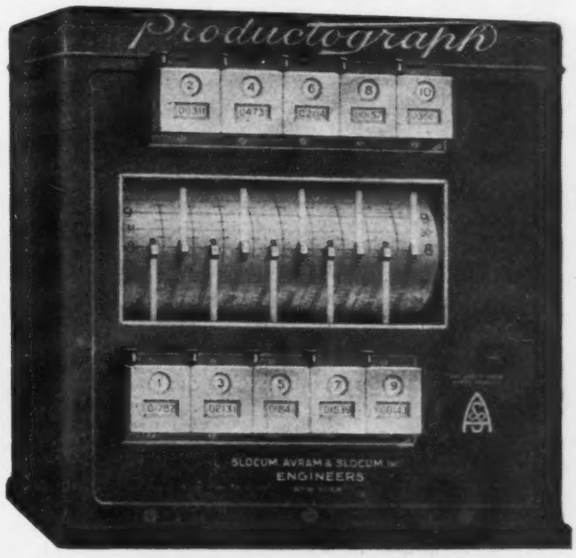
For potentials up to and including 300 volts the voltmeters and wattmeters are self-contained, but for higher potentials an external resistance must be employed. The instruments are capable of withstanding temporary overloads of four times the full-scale value. About 1 watt is required to operate the ammeters of all sizes, while the series coils of the wattmeters require about 1.2 watts at full-scale reading. Voltmeters up to 150 volts have a resistance of 20 ohms per volt and higher-reading instruments 27 ohms per volt. Special voltmeters can be furnished, however, having a resistance of 50 ohms per volt. The damping vane in each of these instruments consists of a rectangular aluminum strip attached along its longer edge to the shaft and permitted to swing in an inclosed brass air chamber. The studs employed to hold these instruments to the switchboards are also used to carry the current to the series and potential coils.



HIGH-TORQUE ALTERNATING-CURRENT INSTRUMENTS

Operation Indicator for Manager's Office

An accurate and continuous record of the operations of any machine can be obtained and registered at any desired place with the electric "productograph" which is being manufactured by Slocum, Avram & Slocum, Inc., 30 Church Street, New York. The device may be placed in a private office where it cannot be tampered with, and records taken by it can be filed directly, thereby saving the clerical labor of copying reports. The apparatus consists of magnet-operated, needle-tipped pointers which draw lines on sensitized record sheets fastened to a cylindrical rotating drum. The drum is made to revolve by clockwork, the sheets being divided into hourly and five-minute divisions. Every tenth line or multiple thereof made by a needle is drawn longer than the rest to facilitate computations from the chart. Counters which record the number of lines drawn



MECHANISM RECORDING TEN SEPARATE OPERATIONS

are operated by the magnets simultaneously with the pointers.

The recording device is made in several sizes, depending on the number of operations which have to be registered. Portable sizes are made for use in mines and on construction jobs. As an adjunct to "safety-first" apparatus the productograph shows the exact time and sequence of related operations. Machines the operations of which are to be recorded are equipped with inclosed switches which actuate the needle pointers and counters. A 16-volt storage battery may be employed to operate the mechanism, but the manufacturers recommend using a small motor-generator set. The cost of energy for operating this apparatus is about 0.5 cent per day per needle at ordinary electric-service rates.

Heat-Resisting Material with Low Thermal Conductivity

Zenitherm, a new heat-resisting and thermal insulating material for fireproofing buildings and insulating any hot or cold surface, which is marketed by the Zenitherm Company, Newark, N. J., consists chiefly of finely ground and screened cork treated with various chemicals and held together by a binder. Since no glue, oil or vegetable matter is used, no decay is possible, and the material is not attacked by vermin.

TABLE I—WEIGHT AND HEAT CONDUCTIVITY OF ZENITHERM COMPARED WITH OTHER SUBSTANCES

Material	Density in Pounds per Cubic Foot	Internal Heat Conductivity	Material	Density in Pounds per Cubic Foot	Internal Heat Conductivity
Steel	490	480	Cement mortar	117.5	3.71
Granite	160–170	22–28	Brick	110	3.63
Ice	57	17	Earth, normal	127	3.63
Sandstone	140–150	7–14	Gravel, dry	115	2.58
Glass	156–196	5.2–7.4	Sand, fine	100	2.15
Limestone	185	13.7–16.9	Oak	44–54	1.7
Limestone	159	9	Slag concrete	34.2	1.53
Limestone	113	4.16	Asbestos	36	1.37
Marble	160–180	3.5–9	Asbestos	29	1.06
Concrete	136	5.24	Pine	28	1.12
Terra cotta	130	4.84	Slag wool	22.4	0.95
Terra cotta	114	3.63	Mineral wool	12.5	0.81
Water	62.4	4.	Air space, 1 in. hor.	0.075	0.86
Plaster	105	3.6–5.5	Zenitherm	30	0.56
Plaster	83.5	2.42	Zenitherm	10	0.32

TABLE II—RESULTS OF FIRE AND HEAT TESTS OF ZENITHERM

Time in Minutes	Temperature of Specimen, Deg. Fahr.		Actual Temperature Rise, Deg. Fahr.
	Under Side	Upper Side	
0	68	68	0
5	603	68	0
10	1146	68	0
15	1249	69	1
20	1404	70	2
25	1573	74	6
30	1720	78	10
35	1732	84	16
40	1744	91	23

Table I shows the heat conductivity of zenitherm compared with other substances. The figures given represent the rate of heat flow in pound-Fahrenheit units per hour through 1 sq. ft. of material 1 in. thick for every degree Fahrenheit difference in temperature between the two faces of the material. Table II shows the actual temperature rise of the unheated side of a specimen of zenitherm 12 in. square and 2.5 in. thick placed over a gas-crucible furnace. Flame tests also made on this material show that temperatures as high as 1700 deg. Fahr. lasting three hours only charred a groove where the flame was applied and did not affect the rest of the substance. Alternate boiling, freezing and thawing have been shown to cause no warping, cracking or other defects.

Zenitherm is ordinarily molded in slabs measuring 18 in. by 48 in. by 0.5 in. to 4 in. thick. As the heat conductivity of the substance depends on its density, slabs are furnished ranging in density from 10 lb. to 50 lb. per cu. ft. Samples of average density have a crushing strength of 280 lb. per sq. in. and a tensile strength of 100 lb. per sq. in. The product is declared to cost not much more than hard wood and is furnished in rough or smooth-surfaced slabs which can take varnish or stain or can be grained to imitate wood. Its electrical resistance is also very high owing to the absence of moisture, the break-down voltage of 1 in. of zenitherm being 12,000.

Compact Continuous Electric Blueprinting Machine

Continuous electric blueprinting machines only 5 ft. long by 2.5 ft. wide by 30 in. high are being marketed by Wickes Brothers, Saginaw, Mich. Prints up to 48 in. in width and of any length can be made in these machines, which take only 5 amp at 110 volts, including the power for the lamp and roll-driving motor. Light for exposing the paper is furnished by a mercury-vapor lamp and is transmitted through the tracing cloth to the sensitized paper without passing through any intervening glass. Since no forced ventilation is required to cool the lamp, the operating mechanism is very simple. Wrinkles and creases which may be present in the paper and tracing are eliminated before printing by passing both sheets through spirally fluted rolls. Gravity is employed to feed the paper into the rolls. The apparatus operates practically without any noise as a variable-speed friction-drive mechanism inclosed by a single housing is employed. Light-excluding compartments are provided for unexposed sensitized paper and for prints so that the machine may be operated in full daylight. All of the control mechanism is placed within convenient reach of the operator feeding the machine.

ELECTRIC BLUEPRINTING MACHINE

Jobber, Dealer and Contractor

Modern Methods of Milwaukee Jobber

Julius Andrae & Sons' Company, electrical jobber, Milwaukee, Wis., recently held a three-day conference of its sales organization to discuss problems involved in the marketing of incandescent lamps. The meeting took place at Pewaukee Lake, Wis., and about twenty-five salesmen were present. Particular attention was given to instructing the jobbers' representatives in the characteristics and uses of the new high-efficiency tungsten lamp, data on these lamps and other types being furnished by representatives of the Bryan-Marsh division, National Lamp Works of the General Electric Company. Among those who addressed the meeting were Messrs. Ward Harrison and F. J. Blaschke, engineering department of the National Quality Lamp Division, Cleveland; J. M. Smith and L. G. Hewins, of the Ivanhoe Metal Works, Cleveland, and J. S. Corby, manager of sales for the Bryan-Marsh Works, Chicago. Mr. H. P. Andrae, who was in charge of the meeting, is a firm believer in keeping up the efficiency of his selling organization by having all salesmen well informed on the subject of the merchandise they are handling, and the long conference on lamps was held that the salesmen of the company might become as well posted as any selling staff in the field.

A feature of the meeting was the presentation to Mr. Corby of a gold watch, testifying the high esteem in which he is held by its donors, the salesmen of the Andrae company. Mr. Otto Borchert made the presentation speech.

Window Displays Well Worth While

A firm believer in the selling value of good "live" window displays, Mr. John J. Elliott, one of the proprietors of the North Avenue Electric Shop, 211 North Avenue, Chicago, changes the exhibits in his windows once every week. Moving displays and flashing effects seem to be most attractive, and in the past several designs

ELECTRICAL DEALER'S WINDOW DISPLAY, NORTH AVENUE, CHICAGO

have appeared at this little shop which have drawn crowds to the windows with the result of increased business.

One interesting and tactful display had for its centerpiece a miniature telephone switchboard rigged out with small lamps and cords. The fine wire lines radiating from the board stretched to various parts of the window, and each terminated at some article representative of the stock of a nearby business man. For instance, a jeweler in the neighborhood was represented by a watch and silver spoon, and at the end of his line these articles were displayed, together with a card carrying his firm name and address. All of the signal lamps on the miniature switchboard were wired so that they flashed alternately, and two large dolls—the chief operator and her assistant—moved their heads and hands and carried on a graphic conversation by means of signs which were invisible except when illuminated by small lamps that flashed behind them. This display pleased the passing public and cemented the existing friendship between the proprietor of the shop and the local business men.

In addition to handling energy-consuming devices and electrical appliances, the North Avenue Electric Shop employs eight wiremen for its contracting work.

Ordinance to License Electrical Contractors at Galveston, Tex.

An ordinance drafted by Mr. W. D. Masterson, city electrician of Galveston, Tex., requiring licenses for all electricians and contractors doing electrical construction work in that city, received general approval at a meeting of the electrical interests of Galveston in the city hall, and if accepted by the city commissioners will reduce the local insurance key rate by the sum of 4 cents.

Section 1 of the proposed ordinance enforces the rules of the National Board of Fire Underwriters for all electrical construction work. Section 2 relates to the issuance of permits to do electrical work. Section 3, covering the requirements imposed before a license shall be issued, reads as follows:

"That any company, firm, corporation or individual desiring to install or undertake a contract for the installation of any wire or wires intended to transmit electric current within any building, or on or attached to any building, shall before doing so obtain from the board of city commissioners a license to do electric wiring and the construction, installation and alteration of electric wiring, work, apparatus and fixtures.

Requirements for License

"The applicant for this license shall state his name, business, residence and previous experience and qualifications, and the applicant shall be indorsed by two responsible contracting electricians or by the city superintendent of electricity, or both. After the approval by the mayor-president and board of city commissioners of the application for license, the city secretary is authorized to issue the license only after the payment of an initial fee of $100, and an annual fee thereafter of $2 shall be paid.

"This license, when issued, shall remain in effect and operation for one year from the date of its issuance, subject to the revocation by the board of city commissioners at any time that it shall be proved that the holder of the license wilfully violated any of the provisions of this ordinance. Licenses issued are not transferable."

Temporary permits will be issued for emergency work, but electrical contractors and electricians will be allowed to use their discretion in making hurried repairs after nightfall to restore customers' service, so that official red tape will not operate to prevent the prompt resumption of electric lighting and motor drive that have met with interruption from any cause.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Trade Reports.—While *Dun's Review* reports the sale of electrical supplies satisfactory in Philadelphia, *Bradstreet's* reports that large orders are not being received by Boston electrical houses, and also that long terms of credit are being sought, with collections not so good as for the preceding week.

Canadian Companies to Co-operate in Purchasing.—A movement has been set on foot by privately owned electric light and motor-service companies to co-operate in the purchase of electrical equipment and supplies. These companies are members of the Canadian Electrical Association, of which the general office is in Toronto. The capital represented is over $200,000,000.

Difference Between American and European Public Utilities.—The difference between the American public utility and the European public utility, according to the head of one of America's largest public utilities, is that the American companies stay ahead of the public, providing facilities before the need of them is discovered. Abroad they have waited until there grew up an insistent demand for service before supplying it.

Tractor for Lumber Company.—A two-wheel-drive detachable 3-ton tractor was recently purchased by the Curtis & Pope Lumber Company, Boston, Mass., from the Eldridge Manufacturing Company of Boston. Three lumber wagons have been converted into trailer wagons, and in the near future three more wagons will be made over, as the tractor is designed to haul six trailers. This tractor is the third unit bought by the above company, the other two being four-wheel-drive machines designed to haul loads of from 5 tons to 7 tons.

May Exports.—*Commercial America* reports May exports of electrical machinery and appliances as follows: Batteries, $57,311; generators, motors and transformers, $739,943; fans, $28,306; insulated wire cable, $91,528; interior wiring supplies and fixtures, $54,983; lamps, $20,798; telegraph instruments, $5,069; telephones, $202,979; other apparatus, $839,803. The value of electric locomotive exports in May, 1914, was $52,368, as against $9,964 for May, 1913. Steam locomotives, however, showed a falling off in exports; the value for May, 1914, was $251,646 and that for May, 1913, was $396,284.

Engineers' Permanent Exhibit.—On Sept. 1 Mr. H. R. Nicholson will open at 40 West Thirty-ninth Street, New York City, rooms for the permanent exhibition of steam valves, fittings and specialties, and electrical goods and appliances. The project has been started with a view toward furnishing a place where engineers may see the apparatus and have its working application explained by an unprejudiced corp of experts. Since the idea was first projected, a week ago, the firms which have contracted for exhibits are the Fairbanks Company, New York, valves; the Patterson-Allen Engineering Company, New York, lap-joints and iron fittings, and the Nason Manufacturing Company, New York, steam traps and specialties.

New Electric-Vehicle Garage.—The Electric Garage Company, Louisville, Ky., was organized recently and will maintain and operate a garage for electric vehicles. This company is said to be the first of its kind in Louisville. The company will also act as agent for the Ohio electric vehicles in this district. Property has been bought on Third Street, plans have been completed for the garage, and salesrooms and contracts have been let. The company expects to get into the new building by the middle of August or shortly afterward. Mr. G. G. Bader, manager for the Ohio Electric Car Company in Louisville, Mr. F. S. Ouerbacker, president of the O. K. Stove & Range Company, and Mr. J. W. Button of the Louisville & Nashville Railroad Company are the incorporators of the new garage company, which is capitalized at $25,000.

Seven-Mile Transmission Line to Light Town.—Rittman, Ohio, a town of 2000 inhabitants, will soon be receiving electric lighting and motor service from the system of the Cleveland Southwestern & Columbus Railway Company, over a 7-mile branch being built from the company's 22,000-volt, three-phase, twenty-five-cycle transmission line. The distribution system in the little city will be operated at 2200 volts, the potential being stepped down by means of an outdoor-type steel substation manufactured by the Delta-Star Electric Company. A street-lighting contract signed with the city will require sixty 100-cp high-efficiency tungsten lamps operated through a Packard series regulator. Rittman is a manufacturing town which has enjoyed a remarkably rapid growth of late, and it is expected that a considerable motor load will be developed.

Electric Cooking for High-School Cafeteria.—The board of education of Salt Lake City, Utah, has awarded to the Inter-Mountain Electric Company of that city the contract for the electric-cooking equipment for the cafeteria of the new East Side High School. The equipment will consist of two electric ranges, one of them to have two 15-in. disk stoves and the other to have one 10-in. disk, one 12-in. disk, two 8-in. disks and two 6-in. disks. A complete assortment of lock-on cooking utensils will be used to fit on the various disks. In order to facilitate baking operations an additional oven has been ordered. A 3-gal. chocolate urn and a 6-ft. electrically heated steam table will also be employed. The electric-cooking equipment for this high school will be supplied by the Simplex Heating Company, Cambridge, Mass. The equipment is intended to serve 800 students at lunch.

Mining Equipment Order.—The Daly Reduction Company, of which the Hedley (B. C.) Gold Mining Company is a subsidiary, has purchased from the Canadian Westinghouse Company a 1250-kva., three-phase, sixty-cycle, 400-r.p.m., 6600-volt waterwheel-driven generator complete with direct-connected exciter, and switchboard, and electrolytic lightning arresters for both the mining company's generating station and the receiving end of the transmission line. The Morgan Smith Company received the order for an 1800-hp waterwheel. A 400-hp synchronous motor, which will be directly connected to a compressor purchased from the Canadian Ingersoll-Rand Company, has been furnished by the Canadian General Electric Company, which also supplied three 400-kw self-cooled transformers and a 400-hp induction motor to drive a compressor at present operated by steam. Greater motor-service facilities for the mining operations of the Daly Reduction Company have been rendered imperative on account of the company's steadily increasing gold output, and the present steam and small hydroelectric plant will be supplemented by the installation of the recently acquired equipment at a point on the Similkameen River, necessitating the construction of a three-mile transmission line between the new hydroelectric development and the mill. Mr. Gilbert McEachern is electrical superintendent of the Daly Reduction Company, and Mr. G. P. Jones is general manager.

Building Operations on Louisville Electric Plant.—Concentration of the electricity-manufacturing operations of the Louisville Gas & Electric Company is brought nearer by the rapid progress which is being made on the addition to the present plant on the water front. This is the station of the former Kentucky Electric Company, which was absorbed by the merger. The rating now is 5000 kw, but the improvements under way contemplate the installation of two 5000-kw turbines and other additions to the equip-

ment, which with the buildings will involve the expenditure of about $500,000. Contracts have been let for the equipment. The building operations have progressed to the point where all is now ready for the steel work.

Electrical Ore Separation for Utah Copper Plants.—Mr. C. A. Hansen, specialist for the General Electric Company on electric-furnace methods and the electrical separation of zinc and copper, is in Salt Lake City, Utah, to study the works of the Utah Copper Company at Bingham and to determine the feasibility of applying electrical ore separation to the local processes. Managing Director D. C. Jackling of the Utah Copper Company, who is also president of the Utah Power & Light Company, which has a contract with the copper company for the supply of its electrical requirements for all smelting and mining work, is interested in the separation problem and is lending every assistance toward its solution.

Central-Station Business in the Pacific and Mountain States.—Returns for May received by the *Electrical World* from the central-station companies in the Pacific and Rocky Mountain States show, on the whole, a lower rate of increase over 1913 than for other sections of the country; and, although it is possible to find here and there in this great area the evidence of booming local industries and a "strong" condition of general business, it must be admitted that on the whole the demand for energy in the industries there is not increasing at a high rate. The readings on the energy meters should provide a trustworthy telltale of the industrial demand; and the only logical conclusion is that in most of the cities on the coast, and in many of the cities of the mining states, times are very far from good. The data presented herewith may be compared with those already published in the *Electrical World* of July 11 and June 13. It will be seen that the figures for May (the latest month for which the returns are generally available) show no improvement over those for previous months. Table I presents a comparison of the gross income of three of the largest Pacific Coast companies over a four-month period, February to May inclusive. The utilities in question are the Pacific Gas & Electric Company, the Southern California Edison Company and the Puget Sound Traction, Light & Power Company, the data having been taken from the statements made public by these three companies. It should be stated that the figures of gross income do not relate exclusively to the sale of energy, but represent the total from all sources. Strictly speaking, therefore, the published returns of the three companies may not be regarded as truly comparable, but it is

TABLE I—PACIFIC STATES—COMPARISON OF GROSS INCOME OVER FOUR-MONTH PERIOD OF PACIFIC GAS & ELECTRIC, SOUTHERN CALIFORNIA EDISON AND PUGET SOUND TRACTION, LIGHT & POWER COMPANIES

	Gross Income		Per Cent Increase
	1914	1913	
February	$2,514,355	$2,343,162	7.2
March	2,480,837	2,418,522	2.6
April	2,490,528	2,387,381	4.3
May	2,467,353	2,422,461	1.8

nevertheless believed that they provide a trustworthy indication of the amount of business which the electric utilities in these three coast cities are now handling. In the case of the Pacific Gas & Electric Company it is known that little more than one-half of the entire gross income is derived from the sale of electric energy; while in the case of Seattle undoubtedly a big percentage comes from street-car fares on the great traction system operated by the Puget Sound Company. It is seen that the combined figures for May for the three companies show a lower rate of increase over 1913 than for any other month in the four-month period. In that month the San Francisco system was the only one of the three to report any improvement in gross earnings over May of last year, and it is not known how much of its 4.5 per cent increase was due to an improved demand on its electric generating stations. One fact which is not brought out in this table, but which is probably of even greater importance than any figures of gross income, is that the Pacific companies in most cases are succeeding in curtailing their operating expenses. Net earnings, as a rule, are showing an increase over 1914, and there seems to be little danger of any reduction in the balance available for dividends. In the case of the Southern California Edison Company, for instance, the balance applicable to dividends on the common stock of the company should be at the rate of about 7.5 per cent for the complete year, provided the record of the first five months can be maintained or bettered. In more than one of the Pacific cities the utility companies for some time will have to continue to depend for a satisfactory showing upon a close curtailment of operating expense rather than upon any substantial increases in gross income. General satisfaction has been felt over the action of the California Railroad Commission in the recent case between the Pacific Gas & Electric Company and the city of Antioch; and the principle involved is of such great importance to the utilities that the decision is certainly worthy of consideration in balancing up the favorable and adverse factors in the electricity supply business on the coast. The vital feature in the case is the establishment of a wholesale rate for energy at the substations; and the decision establishes the highly important principle of allowing 8 per cent return on the full reproduction value, provided the property is in efficient operating condition. In the case under notice the commission decided that the plant of the company was in 100 per cent operating condition, and made a valuation of over $26,000,000, excluding the electric distributing systems, the gas, water and street-railway systems, water rights and inoperative properties. Now that the refinancing plans of the Pacific Gas & Electric Company have been successfully carried out and the monthly statistics are showing that the increased gross is being accompanied by a decreased operating expense, the position of the company cannot be regarded as anything but extremely strong; and this Antioch decision, without any exaggeration of its importance, should certainly be held as another favorable factor. The figures in Table II may throw additional light on the condition of the electric utilities in the Pacific and Mountain States. A comparison is made therein of the gross income and the energy output of four large companies for April and May, operating in Portland, Spokane, Salt Lake City and Denver. Each of the companies handles gross monthly sales of over $150,000, and the combined energy output of the four companies is nearly as great as that of the New York Edison Company. No conclusions should be drawn from the value of 19 per cent given as the rate of energy increase over 1913 in the month of April. This high value is the result solely of the returns from one of the four companies—a system which has assimilated many smaller systems during the last eighteen months, and the increase in output is the direct result of such assimilation. Probably 7 or 8 per cent represents the average rate of the increase of energy demand on the stations of these companies, and that rate very likely is a fair general average for the big cities of the Mountain and Pacific States. In Table III the results for May alone are given, and the conclusions to be drawn therefrom are interesting. It is seen that the returns from six large companies, handling between them $1,000,000 of monthly sales of energy, show an increase of about 10 per cent on both in-

TABLE II—PACIFIC AND MOUNTAIN STATES—COMPARISON OF GROSS INCOME AND OUTPUT FOR APRIL AND MAY, 1914 AND 1913, OF FOUR LARGE COMPANIES IN PORTLAND, ORE., SPOKANE, SALT LAKE CITY AND DENVER

	Gross Income from Sale of Energy			Total Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
April	$706,970	$658,697	7.3	56,674,961	47,598,643	19.0
May	685,251	639,860	7.1	56,326,838	52,511,172	7.3

come and output. In the belief that this rate was considerably in excess of anything which was being realized by the smaller utilities, the *Electrical World* collected figures from a number of additional companies, operating in cities of 25,000 and less, whose monthly business did not exceed $20,000. It is believed that the totals for the eight smaller companies shown in Table III may safely be regarded as typical for cities of the class to which they relate, and it will be noted that the energy demand for 1914 shows a recession from last year. Of the eight utilities, one-half report a decreased output for May, 1914, as compared with last year; and the only conclusion is that in the far West the industries in the smaller cities are not at present as active as formerly. With few exceptions the larger cities are not expanding to a satisfactory extent, and the industrial demand on the central stations is not increasing at its old rate. Whatever the condition in the main industrial centers, the reports from the smaller communities indicate an even less encouraging state of affairs. It may be remembered that an exactly similar conclusion, as applying to the New England States, was developed by the *Electrical World* from the May data for that territory. Although the general summary for the Pacific and Mountain States must be somewhat unfavorable, yet it should be stated that among the reports coming from those sections are several notably satisfactory returns. The Utah Power & Light Company, with its subsidiaries, caters to a very large percentage of the industrial demand of the State of Utah, while the Montana Power Company and its subsidiaries distribute the major portion of all the energy transmitted in Montana. Both of these systems are in thoroughly good shape and reporting good monthly gains. It is probable that the European war will affect both of them for a time, owing to contraction in mining operations, but it cannot be doubted that when shipping arrangements to Europe are placed once more on a satisfactory basis there will be a substantial increase in the demand for energy throughout the mining States. This should be directly reflected in the returns from the utility companies in these States.

TABLE III—PACIFIC AND MOUNTAIN STATES—INCOME AND OUTPUT FOR MAY, 1914 AND 1913, FOR (A) SIX LARGE COMPANIES AND (B) EIGHT SMALL COMPANIES

	Gross Income from Sale of Energy			Total Energy Output in Kw-hr.		
	May, 1914	May, 1913	Per Cent Increase	May, 1914	May, 1913	Per Cent Increase
Six large companies	$1,041,935	$948,578	10.0	99,775,427	90,812,066	9.9
Eight small companies	81,419	78,438	3.8	2,956,700	3,011,718	Decr. 1.8

NEW YORK METAL MARKET PRICES

	Aug. 4 Bid	Aug. 4 Asked	Aug. 11 Bid	Aug. 11 Asked
Copper				
Standard spot*	.....	.....	.....	.....
	Selling Prices		Selling Prices	
	£ s d		£ s d	
London, standard spot*	.. .. ..		.. .. ..	
Prime Lake	12.75	to 12.87½†	12.50	to 12.75†
Electrolytic	12.50	to 12.75†	12.25	to 12.50†
Casting	12.37½	to 12.50†	12.12½	to 12.25†
Copper wire base	14.00	to 14.25	13.75	to 14.00
Lead	3.90		3.90	
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f.o.b. smelter	7.00		7.00	
Spelter, spot	4.90	to 5.00	5.40	to 5.50
Tin, spot*	.....	to	.....	to .....
Aluminum:				
Prompt delivery	19.00	to 20.00	20.00	to 21.00
Future	.....	to	.....	to .....

*COPPER EXPORTS

Total tons to Aug. 11	6,008

*From daily transactions on the New York Metal Exchange.
†Nominal.
NOTE.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.

Corporate and Financial

Monterey, (Mexico) Railway, Light & Power Company.—The directors have felt it necesary to postpone payment of interest due Aug. 2 on the first-mortgage debenture stock until it is possible to transfer the money on reasonable terms.

Lincoln (Ill.) Railway & Light Company Receivership.—Mr. James E. Hobit, cashier of the Lincoln State Bank, has been appointed receiver of the company as a result of suits to foreclose the mortgage securing the bonds. Mr. Hobit assumed charge on July 18.

Ohio State Telephone Company.—A syndicate of Ohio brokers is offering $3,000,000 7 per cent cumulative preferred stock and $900,000 common stock of the new company at $1,000 for ten shares of the preferred stock and three shares of the common stock.

Hamilton Gas & Electric Company.—United States District Judge Hollister sustained in greater part the report of Referee H. H. Haines, levying an assessment of 100 per cent on $300,000 of so-called bonus stock of the Hamilton (Ohio) Gas & Electric Company, issued in 1907. The court held that all creditors whose debts were created after the stock was issued, except those creditors who are holders of bonus stock, or who had knowledge of its issuance prior to the date of the creation of their debt, are entitled to share in the fund arising as a result of the assessment. The court also held that the trustee in bankruptcy of the company may bring a suit in equity to recover. The matter was referred back to Referee Haines with instructions to ascertain which of the creditors hold claims contracted since the issuance of the bonus stock, and with further directions to report his conclusions of fact and law in such a way that the court may either sustain or overrule his findings.

Public Utility Securities.—In a letter H. F. McConnell & Company, dealers in public utility securities, New York, stated: "No quotations are obtainable, nor, in view of the many bank loans in various cities, is it wise to establish a price that in any way has a bearing on intrinsic values. Public utility securities have not acted in a way to cause alarm. Very little stock was offered down, and there seems to have been a buyer on every concession. The passing of the monthly dividend by the Cities Service Company has worried some of the stockholders but under the circumstances was the proper action to take. This act, however, shows the weakness of the international markets and adds to the strength of those companies that have confined their financing to American institutions and the American public. During the past week the writer has interviewed the heads of practically all the large public utility companies and has been informed that no change in dividend policy is contemplated. Neither will there be any change in the price of their commodities. We feel this is a time for every security holder to figure on the intrinsic value of his investment holdings and add to them as circumstances will permit."

Washington-Oregon Corporation Receivership.—The company has been placed in the hands of receivers at Tacoma, Wash. The company was organized in Washington in 1910 to acquire and operate public utility companies. It took over by merger the Vancouver Traction Company, the Vancouver Water Company, the Twin City Light & Traction Company and the Haines Electric Power Company, and through stock ownership controlled the Kalama Electric Light & Power Company, the Clarke County Development Company and the Twin City Light & Power Company. The company operates generating plants in several Washington and Oregon towns, including Hillsboro, Rainier, Kalama, Vancouver, Chehalis and Centralia. Federal Judge Cushman appointed Mr. Elmer M. Hayden temporary receiver. The receivership was asked by the Fidelity Trust Company, of Philadelphia, as trustee for a five-million-dollar bond issue. The officials of the corporation are: Mr. Isaac W. Anderson, Tacoma, Wash., president; Mr. H. G. Fleischhauer, Portland, Ore., general manager, and Mr. Charles A. Johns, Portland, Ore., attorney. The action resulting in the receivership was brought about by the inability of the corporation to meet its obligations. The corporation for the year ended June 30, 1913, reported a deficit after charges had been met.

Business Notes

The Willard Storage Battery Company, Cleveland, Ohio. has arranged to build a plant on East 131st Street, near St. Clair Avenue, Cleveland, within the next three months. The building, which will be one story high and 200 ft. long by 135 ft. wide, will cost about $35,000.

The Beacon Miniature Electric Company, 108 Duane Street, New York City, has opened a branch office at 11 South Desplaines Street, Chicago, Ill., from which all shipments for the middle and extreme West will be made. All correspondence and inquiries covering that territory will also be taken care of by the Chicago office.

Harry G. D. Nutting, public-utility expert and engineer, announces the opening of an office in the First National Bank Building, Milwaukee, Wis., for the purpose of furnishing to public-service utilities expert engineering, accounting and legal service as well as expert management. The purchase and sale of utilities is also included in the scope of the new business.

The Nordberg Manufacturing Company, Milwaukee, Wis., which has negotiated with Usines Carels Frères, Ghent, Belgium, for the sole right to manufacture the Carels-Diesel engines in this country, contemplates producing Nordberg-Carels-Diesel stationary engines on a large scale. W. R. Haynie, 30 Church Street, New York, who was formerly American representative for Usines Carels Frères, has been retained as special representative of the Nordberg company.

The New York Electrical School of Chicago has been established by the New York Electrical School, New York City. The headquarters of the new Western school are at 936-944 North Chicago Avenue, Chicago, and are in charge of Mr. Frank R. Schalck as managing director. Mr. Schalck was for many years associated with the subscription department of the *Electrical Review and Western Electrician*, Chicago. Following the line of work of its parent institution, the Chicago school will give practical instruction in electricity and magnetism for electricians and artisans.

New Industrial Companies

The Electric Service Company, of Cincinnati, Ohio, has been incorporated with a capital stock of $10,000 by John F. Shoemaker, Maurice E. Kieley and T. J. Kieley.

The Detroit Vibrator Company, of Detroit, Mich., has been incorporated with a capital stock of $15,000 to manufacture and deal in electrical vibrators, flatirons and other electrical specialties.

The Electric Game Board Company, of Boston, Mass., has been incorporated with a capital stock of $100,000. The officers are W. H. Gilman, of Newtonville, president, and F. W. Brown, of Cambridge, treasurer.

The Current Electric Company, of Chicago, Ill., has been incorporated by C. R. Barrett, B. Levering and C. L. Barrett, of Chicago, Ill. The company is capitalized at $60,000 and purposes to manufacture electric heating appliances.

Hudson & Son, of New York, N. Y., has been chartered with a capital stock of $10,000 to manufacture electrical machinery. The incorporators are M. L. Hudson, 1482 Broadway; J. H. Mason and W. Miller, all of New York.

The Dunkirk Corporation, of Dunkirk, N. Y., has been incorporated with a capital stock of $30,000 by R. J. Gross, E. K. Buttolph and K. DeH. Caldwell, of Dunkirk. The company purposes to manufacture motors, engines, machinery, etc.

The Wicks Electric Company, of Cleveland, Ohio, has been incorporated with a capital stock of $10,000 by J. C. Keenan, A. G. Wicks, N. C. Ebert, John Ceaman and Herbert Wicks. The company proposes to deal in electrical devices and merchandise.

The American Motor Utilities Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $500,000. The company proposes to manufacture the Compton pneumatic starters and automatic control devices. The incorporators are J. McLaren, F. B. Knowlton and S. V. Dowling, of New York, N. Y.

The United Electric Car Owners' Garage, of Chicago, Ill., has been incorporated with a capital stock of $50,000 by S. G. Abbott, D. S. Bobb and E. F. Rumrill, all of Chicago, Ill. The company proposes to manufacture automobiles and operate garages.

The Cooley Manufacturing Company, of New York, N. Y., has been incorporated with a capital stock of $50,000 to manufacture and deal in engineers' supplies. The incorporators are R. L. and A. C. Henry and Arthur Phelps Marr, 108 Fulton Street, New York, N. Y.

The Lea Courtney Company, of Newark, N. J., has been incorporated with a capital stock of $150,000 for the purpose of carrying on a general electrical engineering business. The incorporators are E. W. Heller and Spaulding Fraser, of Newark, and A. G. Lea, of Hackensack, N. J.

The Western Utilities Corporation, of New York, N. Y., has been incorporated by H. R. Frost, L. C. Haynes and Sydney Norman, 20 Broad Street, New York, N. Y. The company is capitalized at $50,000 and proposes to construct water-supply systems, electrical generating devices, etc.

Trade Publications

Boulevard-Type Fixtures.—King "white-way" fixtures are described in a pamphlet just issued by the King Foundry Company, St. Joseph, Mo.

Flashing Devices.—Thermo-Blink automatic flashers are described in a pamphlet issued by Kelley & Kelley, 105 Liberty Street, Brooklyn, N. Y.

Rear Signal Lamp for Automobiles.—The Standard Signal Lamp Company, Bridgeport, Conn., has sent out a folder describing a rear signal lamp for automobiles.

Slate Slabs.—Prices on slate slabs for electrical apparatus are listed in Price List No. 1 issued by the Davis Slate & Manufacturing Company, 608 East Fortieth Street, Chicago.

Washing Machines.—The Western Electric Company, 463 West Street, New York City, in a booklet entitled "Sunny Monday," describes the modern method of doing household washings.

Rope Transmission.—The American Manufacturing Company, Noble and West Streets, Brooklyn, N. Y., has prepared a sixty-four-page booklet entitled "The Blue Book of Rope Transmission."

Motor-Driven Grocers' Appliances.—The Hobart Manufacturing Company, Troy, Ohio, has issued a catalog describing motor-driven appliances which can be used in grocery stores.

Construction Cleats.—Construction cleats for fastening ceiling bracket switches and standard outlet boxes are referred to in a folder sent out by Alexander M. Knauber & Company, Oak Park, Ill.

Stage-Lighting Apparatus.—Arc lamps with which to light stages for the production of motion pictures are described in a catalog sent out by Kliegl Brothers, 240 West Fiftieth Street, New York City.

Short-Distance Wireless-Telephone Set.—Marconi's Wireless Telegraph Company, Ltd., Strand, London, has issued a pamphlet describing the construction and operation of its short-range wireless-telephone set.

Combined Washer and Wringer Machine.—A bench-type, belt-driven combined washer and wringer machine is described in a folder prepared by the H. F. Brammer Manufacturing Company, Davenport, Ia.

Auto-Horn Push-Button.—An automobile-horn push-button which can be attached to the steering wheel or to a flat surface is described in a folder prepared by the Typhoon Signal Company, Lincoln, Ill.

Blueprint Machines.—Machines for making, washing, drying and ironing blueprints are described in a booklet distributed by the Revolute Machine Company, 417 East Ninety-third Street, New York City.

Steel-Taped Cable.—Illustrated Bulletin No. 200 issued by the Safety Insulated Wire & Cable Company, 114 Liberty Street, New York City, gives comparative costs of conduit and "Safety" cable installations and descriptions of methods of installing, etc.

Personal Mention

Mr. F. E. Wood has been appointed purchasing agent of the Zionsville (Ind.) Water & Electric Light Company.

Mr. D. R. Thomas has succeeded Mr. D. W. Low as manager of the Michigan Power Company, Lansing, Mich.

Mr. Tip. Taylor has resigned as superintendent of the Browne Mills Electric Company, North Manchester, Ind.

Mr. L. Keim has been appointed purchasing agent of the Augusta-Aiken Railway & Electric Corporation, Augusta, Ga.

Mr. L. W. McNamee has succeeded Mr. E. J. Buffington as president of the Gary (Ind.) Heat, Light & Water Company.

Mr. J. C. Sanford has succeeded Mr. A. D. Petit as chief engineer of the Osceola (Iowa) Light, Heat & Power Company.

Mr. E. L. Staley, of Staley & Fees, Wichita, Kan., has been elected president of the Kansas Electrical Contractors' Association.

Mr. A. C. Balch, vice-president of the San Joaquin Light & Power Corporation, Fresno, Cal., has recovered from his recent serious illness and returned to his office.

Mr. H. W. Stone, secretary and treasurer of the Harrisburg (Pa.) Light & Power Company, has been confined to his home for several months with a severe attack of rheumatism.

Mr. B. H. Gardner, formerly sales manager for the properties of the United Electric Light & Water Company, Waterbury, Conn., has succeeded Mr. F. K. Wade as superintendent of the South Norwalk district of that company.

Mr. Bion J. Arnold, of Chicago, has been appointed consulting engineer to the Jersey City Chamber of Commerce. Primarily, his work will consist in planning the development of port facilities. Mr. Arnold is now abroad as a member of the Chicago Railway Terminal Commission.

Mr. J. H. Lindsay, chief engineer for the Atchison (Kan.) Electric Light & Power Company, received a 2300-volt shock from the plant switchboard which rendered him unconscious for a time. Mr. Lindsay was rescued by a switchboard attendant. He is sixty-five years old.

Mr. C. C. Trees has resigned as auditor and assistant secretary of the Indiana Railways & Light Company, Kokomo, Ind., after a connection of eight years with that company. Mr. Trees has been appointed examiner of accounts in the valuation department of the Interstate Commerce Commission, with headquarters at Chicago.

Mr. Frank R. Schalck, of Chicago, for several years connected with the circulation department of the *Western Electrician* and later with the *Electrical Review and Western Electrician*, has been appointed managing director of the New York Electrical School of Chicago, a trade school to teach practical electrical construction and shop work.

Mr. Albert M. Dunham has resigned as assistant auditor of the Narragansett Electric Lighting Company, Providence, R. I., to become secretary to the president of the American Screw Company, Providence. On the occasion of his leaving the Narragansett company, July 31, a gold watch was presented to Mr. Dunham by his associates and the company.

Mr. John F. Hanley has succeeded Mr. E. W. Lothrop as general manager of the Federal Power & Light Company, which controls the Delphos (Ohio) Light & Power Company, the Public Service Company of Van Wert, Ohio, and the Urbana (Ohio) Electric Light Company. Mr. Hanley's headquarters will be at Van Wert. As noted in our Aug. 1 issue, Mr. Hanley supersedes Mr. F. L. Wise as manager of the Public Service Company.

Mr. Charles O. Tappan has resigned as chief engineer of the Northern Power Company and the Hannawa Falls Water Power Company, both of Potsdam, N. Y., and has opened an office at 2 Rector Street, New York City, where he will specialize in hydroelectric development, public utility engineering, and valuation and appraisal work. Before his connection with the companies at Potsdam Mr. Tappan was hydraulic power engineer with the Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Mr. H. C. Sterling has resigned as manager of the Constantine Hydraulic Company, Three Rivers, Mich., to become assistant manager of the Atlantic City (N. J.) Electric Company. In 1888 he and his brother built and operated an electric-lighting plant at Helena, Mont. Later Mr. Sterling became superintendent of the Helena Rapid Transit Company, and when this company was merged with the Helena Power & Light Company he served as manager of the electric department of the consolidated companies. Afterward he purchased and operated the Huron (S. D.) Electric Company, and was also engaged in constructing and operating electric plants in Minnesota, Wisconsin and South Dakota. Mr. Sterling had just completed a term as president of the Michigan Electric Association.

Mr. Harry G. D. Nutting, who has just opened an office in the First National Bank Building, Milwaukee, Wis., as a public utility expert and engineer, is a graduate of the University of Illinois. After leaving college he did extensive experimental work for Fairbanks, Morse & Company, and later became a member of the engineering staff of the Railroad Commission of Wisconsin. Mr. Nutting was next appointed successively manager of the municipal electric plant at Fort Atkinson, Wis., district superintendent for the Central Illinois Public Service Company, Mattoon, Ill., and electrical engineer for the United States Arsenal, Rock Island, Ill. More recently he served as assistant to Mr. Clement C. Smith, of Milwaukee, and Mr. Smith has retained him as consulting expert for the Wisconsin Public Service Company and the Wisconsin Railway, Light & Power Company. Mr. Nutting read a paper on "An Accounting System for a Small Public Utility" before the Wisconsin Electrical Association last January, and he is chairman of that association's committee on extensions and rules of service.

Col. Curtis V. Hard, the new president-elect of the Ohio Electric Light Association, is head of both the Wooster (Ohio) Electric Company and the Cleveland (Ohio) Light & Power Company. Colonel Hard was born at Wooster in 1845, and was educated at Berea College, near Cleveland. A descendant of patriots who took part in both the American Revolution and the War of 1812, young Hard himself enlisted as a soldier in the Civil War, being a member of the 135th Regiment of Ohio Volunteer Infantry. When the Spanish-American War broke out in 1898 he was appointed colonel of the Eighth Ohio, and served with distinction during that conflict. His regiment was with Shafter's corps during the whole of the Cuban campaign, and Col. Hard was present in person at the surrender of Santiago. In 1886 Col. Hard, with several associates, first organized the Wooster Schuyler Electric Company, later renamed the Wooster Electric Company, and in 1909 he became its president. In the meantime he and his son had organized the Cleveland Light & Power Company, of which organization they are still respectively president and treasurer.

C. V. HARD

Obituary

James Wolff, for the last quarter century a well-known and respected figure in electrical jobbers' and manufacturers' associations in the Middle West, died at Milwaukee, Wis., July 30, aged fifty-two years. During his business career Mr. Wolff had been employed as Western representative of the New York Insulated Wire Company, the H. T. Paiste Company and other concerns. In 1896 he acted as secretary pro tem. at the meeting of electrical jobbers and manufacturers which organized the Electrical Credit Association of Chicago, and afterward served as a member of the executive committee of that body for many years. In 1898 he was one of the charter delegates responsible for the formation of the National Electrical Credit Association, and he served on the board of managers of that organization until April 1, 1913.

Construction

New England

LISBON, N. H.—The contract for construction of the addition (130 ft. by 40 ft.) to the power house of the Lisbon Lt. & Pwr. Co. is reported to have been awarded to the H. P. Cummings Construction Co., of Ware, Mass.

NEWPORT, VT.—Within the next two months the Newport El. Lt. Co. expects to erect 3 miles of transmission lines to granite quarry. Charles A. Prouty is president and manager.

GARDNER, MASS.—The installation of a new street-lighting system in West Gardner is under consideration by the Gardner El. Lt. Co. J. D. Whittemore is superintendent.

WESTERLY, R. I.—The Westerly Lt. & Pwr. Co., it is reported, is contemplating replacing the 40-cp street lamps with the new nitrogen lamps of 60 cp.

BRIDGEPORT, CONN.—Work has begun on rebuilding the power house of the Farist Steel Co. on East Main Street, which was destroyed by fire a short time ago. The building will be 55 ft. by 78 ft., one story high.

BRIDGEPORT, CONN.—The building commissioners have granted the United Illg. Co., of Bridgeport, a permit to build an addition to its power plant on Congress Street, to cost about $40,000. The new building will provide space for several new boilers, generators and other machinery.

Middle Atlantic

BROOKLYN, N. Y.—Bids will be received by Robert Adamson, fire commissioner, Headquarters of the Fire Department, Municipal Building, New York, until Aug. 17 for furnishing material, establishing and equipping an extension to the fire-alarm telegraph system in the borough of Brooklyn. Blank forms and other information may be obtained at the above office.

BROOKLYN, N. Y.—Bids will be received by the State Hospital Commission, Capitol, Albany, until Aug. 17, for construction of power house; boilers, equipment and steam conduit; plumbing work; electric equipment and underground electric conduit at the Long Island State Hospital, Brooklyn, N. Y. Drawings and specifications and blank form of proposal are on file at the Long Island State Hospital, Brooklyn, N. Y., at the office of the State Hospital Commission, 1 Madison Avenue, New York, and at the Department of Architecture, Capitol, Albany. Copies of drawings and specifications may be obtained at the Department of Architecture upon deposit of $10, which will be refunded upon return of same. Separate bids to be submitted on each part of the work.

BUFFALO, N. Y.—Bids will be received until Aug. 26 by Francis G. Ward, commissioner of public works, Municipal Building, Buffalo, for construction of an eight-room addition to the present school building in District No. 54, on Main Street, between Jewett and Oakwood Avenues, in accordance with plans and specifications prepared by Green & Wicks, architects, as follows: (A) Masonry, concrete work, cut stone, plastering, etc.; (B) structural iron and steel work; (C) fireproofing, concrete floors, base, partition, etc.; (D) carpentry, millwork, painting, glazing, hardware, etc.; (E) roofing, sheet-metal work, skylights, ventilators, etc.; (F) electrical work, telephone system, bell and battery work, etc.; (G) heating, ventilating, radiation, etc.; (H) plumbing, drainage, gas-fitting, etc. Separate proposals must be submitted on each division. Plans and specifications may be seen at the office of the deputy building commissioner, Room 6, Municipal Building, where blank forms of proposals may be obtained.

GENEVA, N. Y.—The Central New York Gas & Electric Co., of Geneva, has been granted permission by the Public Service Commission to issue $128,000 in bonds, the proceeds of $83,562 to be used for improvements to the electric department.

ITHACA, N. Y.—The Ithaca Trac. Co., successor to the Ithaca Street Ry. Co., has been authorized to execute a mortgage to secure an issue of $2,000,000 in bonds. Of the new bonds, $211,000, together with $400,000 in capital stock, will be issued to acquire all the properties of the Ithaca Street Ry. Co., which include the Remington power plant with equipment and machinery. In addition $277,000 of the new bonds are to be issued to provide funds for extensions and improvements, including double tracking, new bridges, new equipment, generators, boilers and other power-house apparatus. All details have been approved by the Public Service Commission.

NEW YORK, N. Y.—Bids will be received by A. Woods, police commissioner, Police Department, at bookkeeper's office, Headquarters of the Police Department, 241 Center Street, New York, until Aug. 18 for furnishing and installing the electric-light and gas fixtures in the new station house, prison and garage for the Thirty-seventh Precinct, Nos. 229, 231, 233 and 235 West 123d Street, borough of Manhattan. Bids are to be submitted upon blank form prepared by the Police Department, copies of which may be obtained at the office of Beverly S. King, architect, 103 Park Avenue, borough of Manhattan, where plans may be seen.

RANDOLPH, N. Y.—The Public Service Commission has authorized the transfer of the property and franchises of the Randolph Lt. & Pwr. Co., a co-partnership of J. W. Grace and A. W. Woo worth, to the Randolph Lt. & Pwr. Co., Inc., the latter to issue $16,000 in bonds and $17,000 in capital stock, the proceeds of $17,000 to be used to purchase the property of the former; $8,500 is to be expended on the erection of transmission, distribution and street-lighting systems in the company's territory in Conewango and Cherry Valley, and $6,000 will be used to take up a mortgage held by J. W. Grace and A. W. Woolworth.

SYRACUSE, N. Y.—The contract for the construction of a power house for the new tuberculosis sanatarium has been awarded to Clynes & Leamy, at $49,516.

SYRACUSE, N. Y.—The North Syracuse Lt. & Pwr. Co. has applied to the Public Service Commission for permission to erect transmission lines and approval of franchises from the towns of Cicero and Hastings and the village of Central Square.

WEEDSPORT, N. Y.—According to the decision handed down by Supreme Court Justice Sutherland in Syracuse, the village of Weedsport has the right to build a municipal light and power plant. The Weedsport El. Lt. Co. owns a franchise and claimed that the village had not the right to establish a plant.

PHILADELPHIA, PA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Aug. 29 for two 500-kw rotary converter sets for the navy yard at Philadelphia. Specifications can be obtained on application to the bureau or to the commandant of the navy yard named. H. R. Stanford is chief of bureau.

PITTSBURGH, PA.—Plans are being considered by Robert Swan, director of public service, for the installation of an ornamental street-lighting system on Oliver Street, between Smithfield Street and Liberty Avenue.

WILKES-BARRE, PA.—The Borough Council has approved an ordinance providing for a loan of $390,000, in which is included an item of $45,000 for underground conduits for police and fire-alarm wiring and also a system of conduits for wires and cables.

BAYONNE, N. J.—The Public Service El. Co. has submitted a proposition to the City Council providing for installing its wires in underground conduits. The company agrees to expend $25,000 on the work the first year and $10,000 each year thereafter until completed.

VENTNOR CITY, N. J.—The City Council has voted to appropriate $20,000 to install a police and fire-alarm system. Ventnor City has not a post office.

WILMINGTON, DEL.—Bids will be received by the New Castle County Building Commission and the Wilmington Building Commission at the office of the commissions, corner of Market and Tenth Streets, Wilmington, until Aug. 21 for plumbing, heating and ventilating, electric wiring, timbrel vaulting, granite work, marble work, etc., for the new county building for the county of New Castle and the municipal building for the city of Wilmington. Separate proposals are to be submitted for each department of the work. Plans and specifications and blank form for proposals may be obtained at the office of the commission, upon deposit of $50, which will be refunded upon return of same. Thomas F. Gormley is secretary of the commissions.

CUMBERLAND, MD.—The City Council is considering the purchase of a 300-kw generator for the municipal electric-light plant, to cost about $12,000.

RISING SUN, MD.—At an election held Aug. 3 the proposal to issue bonds for a municipal electric-light plant and waterworks system was carried.

STAUNTON, VA.—Within the next 30 days the Staunton Ltg. Co. expects to purchase three 50-kva, 2300-440-volt transformers. The company is now erecting a cooling tower, material for which has been purchased. W. F. Ficklen, Jr., is superintendent.

WASHINGTON, D. C.—Bids will be received by the Secretary of the Interior, Department of the Interior, Washington, D. C., until Aug. 18 for furnishing material and labor for the installation of cement pavements, conduits and manholes in Seventh Street and G Street basement corridors of the Patent Office Building; also until Aug. 25 for furnishing material and installation of cables in conduits, manholes, switches, circuit-breakers, etc., and connecting same ready for use in F Street Northwest and in the old Post Office and Pension Buildings, Washington, D. C., in accordance with plans and specifications, copies of which may be obtained on application to the chief clerk of the department.

WASHINGTON, D. C.—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until Aug. 18 for furnishing material under Proposal 711 as follows: 550 lighting arresters with fuses; 100 complete carbon sets for No. 84 Western Electric switchboard protectors; 400 chromac for Fuller cells; 250 heat coils, Western Electric code No. 67, for common-battery switchboard; 40,000 paper splicing sleeves, 3/16 in. by 3 in.; 300 pairs choke coils for Mason arresters, equipped with carbon blocks and mica insulators; 10 telephone bell extensions, 1000 ohms, mounted in wooden box; 24 closed-circuit, legless telegraph keys; 150 No. 17 electrose insulators; 25 10-amp, type 2 fuses; 25 6-amp, type 3 fuses.

WASHINGTON, D. C.—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until Aug. 20, under Proposal 714, for furnishing the following supplies: For 50,000 ft. flexible-steel armor, galvanized, lead-sheathed, rubber-insulated, one-pair type 251 cable (to be delivered on reels of 1000 ft. each); 500 ft. 20-pair, switchboard, telephone cable (Western Electric Code 24); 6000 ft. antenna, phosphor bronze wire (seven-strand, each strand 32 mils); 2000 ft. 162-mil, rubber-insulated and double-braided solid copper wire (National Electric code standard); 20,000 ft. cross-connecting wire (Western Electric 19 B. & S. gage, insulated with flame-proof braid); 50,000 ft. 40-mil inside, twisted-pair wire; 10,000 ft. ⅝-in. Siemens-Martin messenger strand wire (ultimate breaking strength 6800 lb.); 389,000 ft. 45-mil copper-clad, twisted-pair, outside-distributing wire; 40,000 ft. 36-mil house wire; 10,000 ft. 36-mil pothead wire.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 25 for furnishing material at navy yards and naval stations as follows: Brooklyn, N. Y., Schedule 7158—102,400 lb. A composition tubes (⅝ in. and ⅞-in. outer diameter, 10 ft. and 12 ft. 3 in. long), 3569 lb. rolled naval brass, 24,100 lb. brass tube sheets and 11,100 lb. supporting plates. Boston, Mass., Schedule 7156—5000 lb. 0.029-in. diameter bronze phosphor wire. Bids will also be received until Sept. 1 as follows: Brooklyn, N. Y., Schedule 7166—50 watertight portables, type H, without globe, 1500 composition unions (unfinished, ground cone joint, low pressure). Norfolk, Va., Schedule 7172—one automobile ambulance. Philadelphia, Pa., Schedule 7173—one 12-kw, 110-volt, Roentgen-ray machine, high-frequency apparatus and lead screen. Bids will also be received until Sept. 8 as follows: Mare Island, Cal., Schedule 7171—50,000 lb. copper, grade No. 1, in 20-lb. ingots, 1500 lb. soft-rolled sheet copper, 525 reflectors (prismatic type J. K and L), 100 boiler tubes (2 in. outside diameter, 6 ft. 3 in. long, 0.109 in. thick), 1750 seamless, cold-drawn, steel boiler tubes. Schedule 7149—510 ft. welded lap steel tubing, 237 ground joint, rough brass, hexagon or octagon unions. Pearl Harbor, Hawaii, Schedule 7146—miscellaneous duplex wire, lamp cord, steel conduit, lock nuts, bushings, switches, etc.

North Central

HOLLAND, MICH.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 9 for construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Holland, Mich. Drawings and specifications may be obtained at the above office or from the custodian of site at Holland. O. Wenderoth is supervising architect.

MARQUETTE, MICH.—Work will soon begin on improvements to the municipal electric-light plant, to cost about $2,500. The work will consist primarily of replacing bents under the penstock which carries the water from the upper dam to the power station.

MORRICE, MICH.—The Consumers' Pwr. Co., of Jackson, has applied to the Town Council for a franchise to supply electricity for lamps here.

BOWLING GREEN, OHIO.—Plans for a power plant for the Bowling Green State Normal College have been approved by the board of trustees.

CATAWBA, OHIO.—The Village Council has granted the Urbana Lt. Co., of Urbana, a ten-year franchise, under the terms of which the village will be furnished with electricity for both residential and street-lighting. The franchise provides for a separate contract for street lamps, the village purchasing energy to maintain them. Alfred Jacobs is Mayor.

CLEVELAND, OHIO.—Bids will be received by the city of Cleveland until Aug. 21 for construction of the Walworth Avenue substation for the municipal electric-light plant. The building will be of reinforced concrete, brick and steel, 47 ft. by 101 ft., two stories and basement. The cost is estimated at about $30,000.

CLEVELAND, OHIO.—The Cleveland Ry. Co. will erect new buildings at the Superior Avenue "loop," 11,909 Superior Avenue, duplicating the St. Clair Avenue office, shop and barn group, at a cost of $125,000.

DAYTON, OHIO.—The reconstruction of the building owned by J. R. Gebhart, formerly operated as a flour mill, for the purpose of converting it into a power building for lease to manufacturers, is under way. Power and distribution equipment, it is understood, will be required later.

MARYSVILLE, OHIO.—Bids will be received by the building commission of the Ohio Reformatory for Women, at Marysville, until Aug. 26 as follows: For well house, sanitary sewer, water-softening plant, boiler-feed pumps, high-pressure heater, power-house piping, well pumps, electric switchboard and electric wiring. H. H. Shirer is secretary.

NORTH LEWISBURG, OHIO.—Preparations are being made by the Urbana Lt. Co. to extend its transmission lines to North Lewisburg to furnish electricial service in that town. The company has entered into a contract with F. A. Jordan & Co. to furnish electricity to operate their works.

PEMBERVILLE, OHIO. — Bushman Brothers, owners of the local electric-light plant, have notified the City Council that they will not operate their plant after Oct. 1.

TIFFIN, OHIO.—The Commissioners of Seneca County have granted the Ohio Lt. & Pwr. Co., a subsidiary of the American Gas & El. Co., a franchise to erect electric transmission lines through the cities of Tiffin, Fostoria and Fremont. This is said to be a part of the plan of the company for erecting a large central power plant at Tiffin and distributing electricity from this point to Fremont, Fostoria and other towns in that district.

YOUNGSTOWN, OHIO.—Joint application has been made by the Mahoning County Lt. Co. and Youngstown Heating Co. to the Ohio Public Utilities Commission, asking for authority for the Mahoning company to purchase the property of the Youngstown company for $170,000. The Mahoning also asks for permission to issue $400,000 in capital stock and $600,000 in bonds, the proceeds to be used in making the purchase and in building a new electric plant.

HOPKINSVILLE, KY.—The City Council has authorized a sale of a franchise to construct and operate an electric street railway and electric-light plant in the city of Hopkinsville for a period of 20 years to the highest bidder on Aug. 22.

LOUISVILLE, KY.—Motors, aggregating 400 hp, will be installed by the Kentucky Cotton Yarn Co., of Louisville, being organized with a capital stock of $200,000 to equip and operate a cotton yarn mill. I. F. Phillips is general manager.

LOUISVILLE, KY.—Several electric motors, it is reported, will be required by the Peerless Tire & Rubber Co., 45 to 54 Second Street, Louisville, which has been organized to take over the Wolke Cycle Co. J. E. Guenther is interested in the company.

LOUISVILLE, KY.—The contract for wiring the new Male High School building has been awarded to the Neal El. Co., of Louisville, for $9,000. The contract let by Bailey & Korner, general contractors, provides for wiring only and does not include fixtures. Wires will be installed for lamps, vacuum cleaner, telephones, clock and bell systems.

MIDDLETOWN, KY.—Citizens of this community, which is not incorporated, have provided funds which will insure the lighting of the principal streets of the village.

HUNTINGTON, IND.—The City Council has engaged Charles Brossman, Union Trust Building, Indianapolis, consulting engineer, to take charge of rebuilding the municipal electric-light plant, for which $50,000 in bonds was recently voted. Specifications for the proposed work will soon be completed.

INDIANAPOLIS, IND.—The chief engineer of the City Hospital has submitted a report to the Board of Health recommending improvements and extensions to the power plant at the hospital, at a cost of about $17,000.

LAFAYETTE, IND.—The Board of County Commissioners has decided to erect 30 ornamental lamps, maintained by underground wires, on the improved Main Street levee.

RICHMOND, IND.—The City Council has appropriated $16,000 for the installation of a new street-lighting system. The present plans provide for erecting lamps on trolley poles, unless the property owners meet the additional cost of ornamental standards and conduit system.

BANNER, ILL.—Bids will be received by the commissioners of the Banner Special Drainage and Levee District at the office of W. R. Curran, attorney, of Pekin, until Aug. 26 for an electrically driven drainage pumping plant, complete, consisting of one 36-in. and one 20-in. motor centrifugal pump, the two pumps to have a combined capacity of 92½ ft. per second, against a maximum static pumping head of 20 ft. For further information address the Harmon Engineering Co., of Peoria.

CANTON, ILL.—Work has begun on the construction of the substation of the Canton Gas & El. Co., which will supply electricity to the villages of Glasford, St. David and Norris and other nearby villages.

CHAMPAIGN, ILL.—The Urbana & Champaign Ry., Gas & El. Co., owned and controlled by the Illinois Trac. System, is planning to erect a high-tension transmission line (5 miles long) from its power house in Champaign through the northern parts of both Champaign and Urbana, joining its present line at a point about 2 miles east of Urbana.

SULLIVAN, ILL.—Bonds to the amount of $35,000 have been voted for improvements to the electric-light plant and water-works system.

MENASHA, WIS.—Plans are being prepared for the installation of an ornamental street-lighting system, consisting of 33 100-cp, 250-cp, 400-cp and 600-cp lamps, to cost about $450. Contract has not yet been awarded. John H. Kuester is electrician.

READSTOWN, WIS. — Preparations are being made to install a municipal electric-light plant on the old mill site. The plant will be driven by a Leffel (Samson) water-wheel, already purchased. Equipment to be purchased includes a Woodward waterwheel governor, one 50-kva, three-phase, 60-cycle generator, switchboard and transformer. Material for overhead distribution system and incandescent lighting has been contracted for. The work will be done under the supervision of the Village Board. Edwin M. Tainter, of Viroque, is engineer in charge.

BIGELOW, MINN.—All bids submitted for erection of transmission and distribution system for the city of Bigelow are reported to have been rejected. Earle D. Jackson, Capital Bank Building, St. Paul, Minn., is consulting engineer.

GLENWOOD, MINN.—Plans are being prepared by W. H. Brink, engineer, of St. Paul, Minn., for the installation of a lighting plant in Glenwood.

ST. JAMES, MINN.—The City Council has entered into a contract with the Consumers' Pwr. Co., of St. Paul, whereby the company will furnish electricity to operate the municipal electric system from its Rapidan plant. In order to utilize its energy all transformers and meters will have to be changed and new equipment installed at the pumping plant. The cost is estimated at from $5,000 to $6,000.

DUBUQUE, IA.—The Board of County Supervisors is considering the question of lighting the county farm buildings and grounds with electricity.

IRETON, IA.—Preparations are being prepared for enlarging the plant of the Ireton El. Lt. & Pwr. Co.

ROCK RAPIDS, IA.—The city of Rock Rapids does not contemplate the installation of a municipal electric-light plant as reported in the issue of Aug. 1, as it already has a municipally owned plant. The city is now installing 50 electroliers. J. K. Medberry is city clerk.

ROCK VALLEY, IA.—The Rock Valley El. Co., it is understood, contemplates extending its transmission lines to furnish electrical service to nearby towns.

KANSAS CITY, MO.—Bids will be received by the board of directors of the School District of Kansas City, at the office of the secretary of board, Public Library Building, Kansas City, until Aug. 20 for furnishing material and installing heating and ventilating apparatus, plumbing and drainage, electric wiring and automatic temperature regulation in the Emerson School and new addition thereto. Plans and specifications may be seen at the office of J. H. Brady, chief engineer, Finance Building, Kansas City. James B. Jackson, Jr., is secretary of board.

LINN CREEK, MO.—Plans are being considered for the construction of a hydro-electric plant on Niangua River. The present plans provide for the construction of five dams between Linn Creek and Bennet's Mills, and the erection of a steel transmission line to distribute electricity within a radius of 100 miles. L. C. Scott, engineer, of Linn Creek, and Chicago capitalists are reported to be interested in the project.

MONETT, MO.—Bonds have been voted for the installation of a municipal electric-light plant.

MONTROSE, MO.—The City Council has engaged E. T. Archer, New England Building, Kansas City, Mo., consulting engineer, to take charge of the engineering work in connection with the proposed municipal electric-light plant, for which $6,000 in bonds were recently voted.

PALMYRA, MO.—The City Council has engaged Freeman D. Martin, Rialto Building, Kansas City, consulting engineer, to take charge of the proposed improvements and extensions to the municipal electric-light plant and water-works system, for which $26,000 in bonds was recently voted.

CROSBY, N. D.—The installation of an ornamental street-lighting system in Crosby is reported to be under consideration.

ADAMS, NEB.—Preparations are being made for the installation of a municipal electric-light plant. The equipment will consist of two generators belted to oil engines, two-panel switchboard and six transformers; material for 4 miles of overhead distribution lines will be required. Contracts for construction of system will be awarded in about 45 days. Johnson & Johnson, of Falls City, are engineers.

DAVID CITY, NEB.—The power plant of the David City water-works was damaged by fire recently, causing a loss of about $2,000.

PENBROOK, NEB.—The installation of an electric-lighting system in Penbrook, the service to be supplied by the Harrisburg Lt. & Pwr. Co., is reported to be under consideration. Post office address, Penbrook, R. F. D. Norden.

KANSAS CITY, KAN.—At an election to be held Aug. 25 the proposal to issue $650,000 in bonds for extensions to the municipal electric-light plant and water-works system will be submitted to the voters.

Southern States

BURGAW, N. C.—The City Council is contemplating submitting the proposal to issue bonds for a municipal electric-light plant and water-works system to the voters.

HIGH POINT, N. C.—The North Carolina Pub. Ser. Co., of High Point, it is reported, has submitted a proposal to the City Council offering to install an ornamental lighting system (five-lamp clusters) in the business district.

KINSTON, N. C.—The city of Kinston is considering the question of furnishing electricity in Snow Hill. The proposed plan includes the erection of a transmission line 16 miles long, to connect the two cities.

WINSTON-SALEM, N. C.—The Board of Aldermen is considering the installation of an ornamental lighting system in the downtown district and also improving the lighting system in the outlying sections. The Southern Public Utilities Co., which furnishes the local electric service, has submitted a proposal to Council offering to install ornamental lamps around the Court Square and on 10 blocks in the business section, provided a contract can be made with the city for a sufficient time to warrant the expenditure.

BELTON, S. C.—The Belton Pwr. Co. expects to purchase improved lighting arresters for its main station and is also considering the adoption of steel poles to replace the creosoted ones now in use for its transmission line. The company has recently purchased 100 kw in transformers to increase its lighting capacity. William H. Trammel is superintendent.

WESTMINSTER, S. C.—An election will soon be called to vote on the proposal to issue $16,000 in bonds for the installation of a municipal electric-light plant. The proposed plant will be operated by steam power. Preliminary plans have been pre-

pared by the J. B. McCreery Co., of Atlanta, Ga. H. B. Gilbert is Mayor.

WINNSBORO, S. C.—At an election held Aug. 4 the proposal to issue $100,000 in bonds, the proceeds to be used for extensions to the electric-light system, also for water-works and sewerage systems, was carried. The J. B. McCrary Co., of Atlanta, Ga., is engineer in charge. T. R. Ericson is superintendent of electric-light plant.

AMERICUS, GA.—The Americus Public Utilities Co. and the Americus Pwr. Co., it is reported, have been consolidated under the name of the Americus Pub. Ser. Co. The State Railroad Commission has authorized an issue of $225,000 in new securities to retire securities of former company. It is understood that one plant will be dismantled and sold and the remaining plant will be operated by the new company. The officers of the new company are: L. G. Council, president; W. Edward Brown, vice-president, and Frank Lanier, secretary and treasurer.

CLARKESVILLE, GA.—Plans are being considered for the installation of an electric-light plant in Clarkesville. A water-power site has been located within 4 miles of the city where sufficient power can be developed. Tentative plans, it is reported, provide for the erection of a steam plant at a point on the river where the dam is to be built, to be used while the dam is being erected and to be kept for use in emergencies when the water-power is available. W. T. Proctor and W. R. Polk, of Atlanta, electrical engineers, have charge of engineering work.

CLEARWATER, FLA.—The City Council has granted C. H. Evans and others a franchise to construct an electric-light plant in Clearwater. The franchise will be submitted to the voters for approval on Aug. 25.

MARIANNA, FLA.—At an election to be held Oct. 20 the proposal to issue $35,000 for improvements and extensions to the municipal electric-light plant will be submitted to the voters.

OVIEDO, FLA.—The installation of an electric-light plant and ice factory in Oviedo is under consideration. M. M. Smith, of Oviedo, is interested in the project.

ZOLFO, FLA.—The Zolfo El. Co., recently organized, is planning to install an electric-light plant, the equipment to consist of a 50-hp engine and a 60-hp boiler with electric generating machinery to maintain about 1000 lamps. Bids for the above equipment will be received by G. W. Adams, care of Zolfo Springs Truth, Zolfo.

JACKSON, TENN.—The Jackson Ry. & Lt. Co. contemplates the purchase of new shaker grates for four boilers and also a 250-kw rotary converter, in the near future, for its power house in Jackson.

BAY MINETTE, ALA.—The citizens have voted to issue $5,000 in bonds for the installation of a municipal electric-light plant. Edgar B. Kay, of Tuscaloosa, is consulting engineer.

GRETNA, LA.—The City Council is considering a number of public improvements, including a street-lighting and water service.

MAGNUM, OKLA.—The citizens on Aug. 4 voted to issue $10,000 in bonds for the installation of a municipal electric-light plant. John H. Tomme is city clerk.

BOGATA, TEX.—A stock company is being formed for the purpose of installing an electric-light plant in Bogata. Roy Briggs, of Brownwood, is interested in the company.

DEL RIO, TEX.—Within the next eight months the City Ice & El. Co. expects to purchase one 4-ton electric truck for its ice and fuel department. W. H. Wolff is vice-president.

FORT WORTH, TEX.—An ornamental lighting system is being installed on the North Main Street and West Seventh Street bridges, consisting of 64 standards carrying three-lamp clusters (one 100-watt and two 60-watt lamps), maintained by underground conduits, to cost about $2,500. The lamps on the Main Street bridge have been put in service and the material for the other has been purchased. The city Light Department has charge of the work. C. F. Crabtree is superintendent and city electrician.

GEORGE WEST, TEX.—Bids will be received until Aug. 24, it is reported by George W. West, of San Antonio, for the construction of an electric-light plant and water-works system in George West, to cost about $24,000. Bartlett & Ranney, 108 East Crockett Street, San Antonio, are consulting engineers.

PALACIOS, TEX.—Within the next four months Charles H. Trego, owner of the local electric plant and ice factory, expects to purchase one 50-hp crude-oil engine and possibly a three-phase dynamo (directly connected); also apparatus necessary to use raw water.

PALESTINE, TEX.—Application will soon be made, it is reported, to the City Council by W. P. Brashier, of Corpus Christi, for a franchise to construct an electric railway on certain streets of the city.

ROBY, TEX.—The Roby District Union Gin Association, it is reported, contemplates the installation of an electric generator to maintain from 40 to 50 lamps. T. E. Avis is manager.

SEGUIN, TEX.—Within the next three months the Seguin El. Lt. & Pwr. Co. expects to erect a new concrete power house to replace the present wooden building; also to purchase two 150-hp vertical water-wheels and transmission machinery, one 187-kva, three-phase, 60-cycle, 2300-volt generator (directly connected), one exciter, one exciter panel and one feeder panel for switchboard. Owen A. Gafford is manager.

THREE RIVERS, TEX.—The Hamilton Townsite Co. has decided to install a 25-kw alternating-current electric-light plant here. Three Rivers has not a post office. lines.

Pacific States

CHEHALIS, WASH.—The City Commission is contemplating the purchase of the local electric-lighting system owned by the Washington-Oregon Corpn. A committee has been appointed to look into the proposition.

EDMONDS, WASH.—The County Commissioners have granted the Edmonds Lt. & Pwr. Co., of Edmonds, a franchise to extend its transmission lines in Snohomish County.

SEATTLE, WASH.—The Board of Public Works has awarded the contract for furnishing the city lighting department with electric lamps to the Pacific Lamp & Supply Co. on its bid of $80,000.

STELLACOOM, WASH.—Bids will soon be received, it is reported, by Joseph Bowron, town clerk, for furnishing materials, excepting poles, for the erection of a transmission line from the city limits of Tacoma to and within the city limits of Stellacoom. Plans and specifications are on file in the office of the town clerk.

TOLEDO, WASH.—Surveys have been completed by the Independent El. Co., a subsidiary of the Washington-Oregon Corpn., of Vancouver, Wash., for the extension of its transmission lines from Winlock to Toledo; work will soon begin on erection of same. When the line is completed a 24-hour service will be established in Toledo.

HOOD RIVER, ORE.—Application has been made to John H. Lewis, state engineer, by August Guignard, of Hood River, for permission to appropriate sufficient water from Hood River to develop 2000 hp. It is understood that Mr. Guignard intends to build a hydroelectric plant and supply farmers in Hood River Valley with electricity for lamps and motors.

RIDDLE, ORE.—The Oregon-California Pwr. Co. is contemplating the erection of a transmission line from its present terminus at Ferndale, Cal., through Riddle to Canyonville, at a cost of from $40,000 to $50,000. The line, it is expected, will be extended into the Myrtle Creek district and eventually as far north as Roseburg. Messrs. Alenderfer & Kronemiller are representatives of the company.

HEMET, CAL.—The Southern Sierras Pwr. Co., of Riverside, has submitted a proposal to the City Council for lighting the streets of the city.

LOS ANGELES, CAL.—Plans have been prepared for the installation of a new fire alarm and police-signal system in Los Angeles, to cost about $200,000.

PORTERVILLE, CAL.—The city officials are considering the question of establishing a municipal electric and gas plant in Porterville.

BOISE, IDAHO.—The Idaho-Oregon Lt. & Pwr. Co., with headquarters in Boise, has resumed work on its Oxbow plant, the construction of which has been held in abeyance, owing to financial difficulties. W. J. Ferris, receiver, has recently completed arrangements for the installation of a 3600-kva Westinghouse generating unit.

SALMON CITY, IDAHO.—The Salmon River Lt. & Pwr. Co., recently incorporated with a capital stock of $400,000, proposes to build a power plant on the Salmon River and erect transmission lines throughout the county. Contracts for construction of the plant will soon be let. The proposed plant, it is understood, will supply electricity to the Gilmore mines, and will also furnish energy to operate the new gold dredge to be erected near the Salmon. The Lemhi Co., it is said, has transferred all its holdings in this county to the Salmon River company. The officers are: C. L. Mackenzie, president; H. H. Boomer, vice-president; W. A. Monroe, secretary; R. Irvin, treasurer, and E. Riggs, general manager.

GREEN RIVER, UTAH.—At an election held Aug. 1 the proposal to install a municipal electric-light plant was carried. Bonds to the amount of $200,000, it is understood, have been issued to build the plant.

PHOENIX, ARIZ.—The franchise and other holdings of the Salt River Valley El. Co. have been purchased by R. W. Martin, of New York, N. Y., and associates, who, it is reported, propose to construct an interurban electric railway between Phoenix and Mesa, via Tempe, a distance of 18 miles. An electric power plant will be built in connection with the project.

ANACONDA, MONT.—The City Council has passed an ordinance providing for the installation of electric lamps on Commercial Avenue, for which bids will soon be asked.

BOULDER, COL.—The stockholders of the Northern Colorado Pwr. Co., of Boulder, have voted to change the name of the company to the Western Lt. & Pwr. Co. and to increase the capital stock from $1,000,000 to $1,500,000.

Canada

CALGARY, ALTA.—A by-law authorizing an expenditure of $300,000 for extensions to the municipal electric-light plant has been approved by the ratepayers.

VANCOUVER, B. C.—Preliminary investigations and estimates are being made by the Canadian Northern Ry. Co. for developing the water-powers of the Sumallo and Nickaloon Rivers. It is estimated that 50,000 hp can be developed, which will be transmitted to Port Mann, where it will be utilized to operate the trains of the Canadian Northern Railway from Port Mann to the False Creek terminals in Vancouver.

STONY MOUNTAIN, MAN.—The Winnipeg, Selkirk & Lake Winnipeg Ry. Co. is contemplating the construction of a new substation at Stony Mountain.

BOLTON, ONT.—The ratepayers on Aug. 3 voted in favor of the proposal to contract with the Hydro-Electric Power Commission to furnish electricity in Bolton. About $6,000 will be required to remodel the power plant. The transmission line will be extended from Weston and Woodbridge to Bolton.

ORILLIA, ONT.—Tenders will be received by the Town Council until Aug. 24 for furnishing equipment under water-works specifications as follows: Contract (E) furnishing and erecting motor-driven turbine pumps and equipment; (F) furnishing and erecting a Diesel oil engine and appurtenances; (G) furnishing and erection of a mechanical pressure-type filtration plant. W. K. Greenwood is engineer.

PORT ARTHUR, ONT.—The City Council has awarded the contract for the erection of a pumping station to the Thunder Bay Contracting Co. at $15,000. The equipment will consist of three motor-generators and three pumps having a capacity of 2000 gal. per minute under 300-ft. head.

TORONTO, ONT.—Tenders will be received by W. C. Wilkinson, secretary and treasurer of board of education of Toronto, until Aug. 28 for construction of High School of Commerce (new building). Specifications may be seen and all information may be obtained at the office of the superintendent of buildings, City Hall, Toronto.

ALMA, QUE.—Plans are being considered, it is reported, by a New York syndicate, in which Col. B. A. Scott, 3 Ste. Genevieve Avenue, Quebec, is interested, for the construction of a power plant at Alma and erection of pulp and paper mills at Jonquières, 20 miles distant, to cost approximately $4,000,000. Alma has not a post office.

New Incorporations

MENA, ARK.—The Bear State Pwr. & Development Co. has been incorporated with a capital stock of $25,000 by George D. Thayer, J. W. Bradley and Minor Pipkin.

ZOLFO, FLA.—The Zolfo El. Co. has been organized with a capital stock of $10,000 to install an electric-light plant. The officers are: H. G. Murphy, president; Fitz Williams, vice-president; J. I. Roberts, secretary, and C. A. Skipper, treasurer.

WATERLOO, IA.—The Cedar Valley Pwr. Co. has been chartered with a capital stock of $1,000,000. The officers are: H. H. Coughland, president; M. A. Harrison, of Hampton, vice-president, and A. L. Dodd, of Charles City, secretary and treasurer.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED AUG. 4, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,105,629. FOUR-PARTY KEY; A. F. Dixon, Newark, N. J. App. filed June 11, 1910. Simplification in the mounting and construction of the keys.

1,105,656. ELECTRIC FURNACE PROCESS AND ELECTRIC FURNACE; C. Hering, Philadelphia, Pa. App. filed July 15, 1911. Molten mass in tubes is connected with the electrodes and constitutes the resistor. (Fifty-three claims.)

1,105,659. SPARKING DEVICE FOR INTERNAL-COMBUSTION ENGINES; G. Honold, Stuttgart, Germany. App. filed July 29, 1910. Electromagnetic spark plug.

1,105,662. INSULATED TROLLEY CROSSING; F. C. Hornstein, Indianapolis, Ind. App. filed March 6, 1911. Parts made readily separable.

1,105,664. INSULATED CLEAT; B. G. Jansson, Malden, Mass. App. filed July 29, 1912. Wooden button concaved on under side to grip wires.

1,105,696. SPEED GOVERNOR FOR PRIME MOVERS; G. Rennerfelt, New York, N. Y. App. filed Oct. 10, 1908. Turbine control; avoids "hunting."

1,105,716. SYSTEM OF DISTRIBUTION; E. Thomson, Swampscott, Mass. App. filed Aug. 4, 1911. Reduces voltage in alternating-current circuits when current therein exceeds the amount contracted for.

1,105,717. OZONE PRODUCER; H. A. Thomson, Glasgow, Scotland. App. filed Aug. 5, 1912. Embodies glass cylinders having internal and external electrodes of wire cloth.

1,105,736. BOILER-FEED SYSTEM; J. Wilkinson, Boston, Mass. App. filed May 31, 1912. Lamps indicate when the boilers of a "battery" are delivering their proportionate load.

1,105,741. CURRENT CONDUCTING AND DISTRIBUTING DEVICE FOR INTERNAL-COMBUSTION ENGINES; F. A. Zika, Chicago, Ill. App. filed June 9, 1913. Connections from the spark plugs mounted in a holder, the ends of the connections being exposed and directly engaged by a distributor arm and the holder being oscillatable for advancing or retarding ignition.

1,105,754. ELECTRIC-TRAIN DISTRIBUTION; E. R. Carichoff, Schenectady, N. Y. App. filed March 24, 1913. When the trolley of any car is removed the transforming device of that car is prevented from supplying energy to any other circuit in the car.

1,105,761. RELAY SOUNDER ATTACHMENT; S. L. Dickson, Short Creek, W. Va. App. filed Sept. 2, 1913. Adjustable diaphragms engaged by the armature lever.

1,105,764. APPARATUS FOR MAKING WELDED TUBING; W. C. Frick, Deal Beach, N. J. App. filed July 19, 1909. Electrically heats first one edge and then the opposite edge of the skelp.

1,105,765. APPARATUS FOR WELDING TUBING; W. C. Frick, Deal Beach, N. J. App. filed July 19, 1909. Has grooved feeding rolls which are electrically connected.

1,105,766. INDIVIDUAL CALLING KEY; M. F. Geer and R. C. Leake, Rochester, N. Y. App. filed May 10, 1911. Governs the starting and stopping of a generator to furnish current for the impulses.

1,105,770. MINIATURE ELECTRIC LAMP; H. E. Gustafson, Pueblo, Col. App. filed Feb. 25, 1914. Attachment for the under side of the cover of a "talking machine."

1,105,771. SEARCHLIGHT MECHANISM; J. L. Hall, Schenectady, N. Y. App. filed April 21, 1910. Special mounting and adjustment for the electrodes.

1,105,783. COOLING ELECTRICAL APPARATUS; H. M. Hobart, Schenectady, N. Y. App. filed Nov. 11, 1913. Prevents condensation of moisture from the air within a transformer tank by cooling the entering air.

1,105,787. APPARATUS FOR IGNITION OF REVERSIBLE INTERNAL-COMBUSTION MOTORS; G. Honold, Stuttgart, Germany. App. filed March 19, 1910. Special polar construction of magneto-electric generator.

1,105,793. AUTOMATIC SIGNALING DEVICE; P. C. Johnson, Halifax, Canada. App. filed April 10, 1913. Contacts for rear auto signal operated by turning of steering wheel.

1,105,795. FLEXIBLE TUBING; W. A. Johnston, Prince's Bay, N. Y. App. filed May 23, 1913. Has an embedded electrical conductor for heating an anesthetic passing therethrough.

1,105,806. COMPUTING SCALE ILLUMINATING DEVICE; C. B. Longstreth, Dayton, Ohio. App. filed Jan. 4, 1909. Has an auxiliary scale-controlled circuit which controls the lighting circuit.

1,105,811. SEQUENCE SWITCH; F. R. McBerty, New Rochelle, N. Y. App. filed Sept. 5, 1908. Embodies a rotary shaft and a series of cams and switch springs.

1,105,823. AUTOMATIC SWITCH ARRANGEMENT; L. C. Nicholson, Buffalo, N. Y. App. filed Jan. 26, 1912. Automatically inserts a new fuse when a fuse blows.

1,105,829. ELECTRIC SIGNALING MECHANISM; O. D. Plummer, G. H. Hausser and E. A. Warner, Altoona, Pa. App. filed April 24, 1913. Automatically replaces a burnt-out lamp in a signal.

1,105,837. SIGNAL-RECEIVING DEVICE; C. S. Rhoads, Jr., Sandwich, Ill. App. filed Aug. 8, 1911. Substation receiving device for use in signaling systems.

1,105,842. SUBSTATION SIGNALING APPARATUS; H. O. Rugh, Sandwich, Pa. App. filed Dec. 14, 1911. Sluggishly acting magnet for controlling the operation.

1,105,843. CONTROL SYSTEM; H. O. Rugh, Sandwich, Ill. App. filed Aug. 26, 1912. For selectively calling any of a plurality of stations along a railway signaling circuit.

1,105,859. ELECTRIC FURNACE; E. Stassano, Turin, Italy. App. filed Oct. 15, 1913. Oscillating furnace which can be adjusted by hand to regulate the height of its casting outlet.

1,105,860. SIGNALING SYSTEM; C. Stephens, Barton Heights, Va. App. filed Aug. 31, 1909. Automatic operation of semaphores on single track.

1,105,883. FAULT LOCALIZER; E. E. F. Creighton, Schenectady, N. Y. App. filed May 14, 1913. For cable transmission systems; metallic sheath of cable is divided into insulated sections.

1,105,887. ARC-LAMP ELECTRODE; C. W. Dake, Chicago, Ill. App. filed April 13, 1912. Has tungsten or like metallic sheath of high fusing point which resists disintegration.

1,105,889. CONNECTOR; G. St. J. Day, Oldham, England. App. filed May 20, 1913. Terminal grips wire end without use of fixing screws.

1,105,907. CONTACT SWITCH-BOX; S. R. Hipple, Williamsport, Pa., and W. L. Conwell, Montclair, N. J. App. filed June 17, 1912. For supplying propelling current to motors of car passing over track.

1,105,908. INCANDESCENT ELECTRIC LAMP; W. G. Hughes, Pittsburgh, Pa. App. filed Dec. 16, 1912. Spirally wound filament braced at the center and wound closer at the apex where braced.

1,105,920. TELEGRAPHY; L. M. Potts, Baltimore, Md. App. filed June 17, 1909. Automatic transmitter and other features. (Forty-nine claims.)

1,105,921. PUNCHING MACHINE; L. M. Potts, Baltimore, Md. App. filed June 17, 1909. For punching the sheets used on automatic telegraph transmitters. (Fifty-one claims.)

1,105,922. TELEGRAPHY; L. M. Potts, Baltimore, Md. App. filed June 17, 1909. Combined receiver and manual transmitter.

1,105,923. RAILWAY SIGNALING OR TRAIN CONTROL; F. W. Prentice, Toronto, Ontario, Canada. App. filed March 27, 1911. Generator of Hertzian waves controlled by conditions of safety to propagate such waves.

1,105,924. TELEPHONE; E. S. Pridham and P. L. Jensen, Napa, Cal. App. filed Aug. 20, 1913. Special receiving apparatus.

1,105,938. LOCK FOR PORTABLE ARTICLES; A. C. Terrill, Glendale, Cal. App. filed April 21, 1913. Locking pin which engages lamp base has a frusto-conical key-receiving head.

1,105,962. ELECTRICALLY HEATED DEVICE; F. E. Carlson, New Britain, Conn. App. filed Dec. 4, 1913. Curling iron.

1,105,984. APPARATUS FOR THE PRODUCTION OF CONTINUOUS ELECTRICAL OSCILLATIONS; H. Manders, London, Eng. App. filed Oct. 30, 1909. Condenser electrodes of block form having flattened discharge area.

1,105,995. FACTORY TAG OR TICKET-MAKING APPARATUS; C. H. Nichols, Haverhill, Mass. App. filed June 7, 1909. Cost system for factory use; employs special card-punching mechanism. (Seventy-two claims.)

1,106,001. TELEGRAPH REPEATER; G. L. Rawdon, Cleveland, Ohio. App. filed April 24, 1913. Embodies a triple-wound magnet.

1,106,039. TREATMENT OF SEED GRAIN; H. E. Fry, Godmanstone, Dorchester, England. App. filed Oct. 10, 1913. Placed in a solution of manure through which an electric current is passed.

1,106,053. CONNECTOR; L. C. Nichols, Milwaukee, Wis. App. filed Dec. 29, 1909. Clamp in form of a single sleeve-like member having two separated tubular wire-receiving portions.

1,106,072. FRANGIBLE COVERED GUARD; C. E. Beach, Binghamton, N. Y. App. filed Feb. 5, 1914. For fire-alarm box key.

1,106,092. TRAIN CONTROLLING AND STOPPING SYSTEM; G. R. Guild, Fort Bayard, N. M. App. filed June 2, 1913. Electrical and mechanical devices on track bed cooperate with train.

1,106,095. ELECTRICAL BATTERY; A. S. Hubbard, Belleville, N. J. App. filed April 22, 1911. Insulating supports for the cells of storage battery and lead linings protected from corrosion.

1,106,116. REMOTE-CONTROL SYSTEM; W. M. Scott, Philadelphia, Pa. App. filed April 23, 1907. Motor operating always in one direction serves for operating switch in both directions.

1,106,118. SWITCHBOARD PLUG; L. H. Snyder, White Lake, S. D. App. filed May 17, 1909. Has a contact tip and a handle portion formed at an angle thereto.

1,106,125. BATTERY; W. E. Winship, New York, N. Y. App. filed Jan. 24, 1911. Secondary; has a tank of porous structure.

1,106,126. OPERATING DEVICE FOR ELECTRIC SWITCHES; A. T. Ytterberg, Wisby, Sweden. App. filed March 30, 1909. Special arrangement of electromagnets. (Forty claims.)

1,106,134. SIGNAL FOR MOTOR VEHICLES; O. W. Cowgill, St. Louis, Mo. App. filed March 31, 1913. Semaphore arm carries lamp which is normally received in a lamp housing.

1,106,151. FIRE-ALARM SYSTEM; G. H. Matthews, Uniontown, Pa. App. filed Nov. 25, 1913. Fuse sets off alarm and visual signals.

1,106,166. ELECTRIC FURNACE; N. Testrop, London, England, and T. Rigby, Dumfries, Scotland. App. filed Dec. 6, 1911. Smelting furnace, peat used as fuel.

1,106,183. CABLE HOOK; A. F. Berger, Holden, W. Va. App. filed July 18, 1913. For "gathering locomotives"; has a fuse which blows out on overload.

1,106,187. ELECTROMAGNET AND SIMILAR APPARATUS; P. Bossu, Paris, France. App. filed Dec. 14, 1912. Automatically compensates for reluctance.

1,106,230. CONTACT INTERRUPTER; A. H. Maître and V. H. Martin, Rouen, France. App. filed Aug. 11, 1909. For vibrating bells.

1,106,281. TIME SWITCH; M. Chiavetta, New York, N. Y. App. filed April 19, 1913. For illuminated signs.

1,106,284. ACCOUNTING SYSTEM; W. J. Crumpton, Evanston, Ill. App. filed June 28, 1909. For accounting time and wages of workmen.

1,106,294. ELEVATOR DOOR SAFETY DEVICE; E. M. Fraiser, San Francisco, Cal. App. filed Oct. 21, 1911. Prevents starting when any door is open.

1,106,334. CAR HEATER; W. S. Menden, Brooklyn, N. Y. App. filed March 24, 1914. Utilizes the heat produced by the motor.

1,106,347. ELECTRODE FOR WELDING; A. B. Herrick, New York, N. Y. App. filed Nov. 29, 1912. Of laminated structure with the laminas disposed transversely to the line of current flow.